

Some pages of this thesis may have been removed for copyright restrictions.

If you have discovered material in Aston Research Explorer which is unlawful e.g. breaches copyright, (either yours or that of a third party) or any other law, including but not limited to those relating to patent, trademark, confidentiality, data protection, obscenity, defamation, libel, then please read our [Takedown policy](#) and contact the service immediately (openaccess@aston.ac.uk)

An Examination of the Causes, Contributory Factors and Consequences of Dispensing Errors in Community Pharmacy and the Experiences of Community Pharmacists in Ensuring Accuracy during the Dispensing Process

Sadia Kousar

Doctor of Philosophy

Aston University

October 2017

© Sadia Kousar

Sadia Kousar asserts her moral right to be identified as the author of this thesis. This copy of the thesis has been supplied on condition that anyone who consults it is understood to recognise that its copyright rests with the author and that no quotation from the thesis and no information derived from it may be published without prior acknowledgement

Abstract

Purpose: Since 2005, community pharmacist workload has increased. This has been accompanied by an increase in stress and work pressures, and a decrease in job satisfaction. However, at present, it is unclear how these factors are impacting the ability of community pharmacists to ensure accuracy during the dispensing process. This research seeks to extend our understanding of the nature, outcome and predictors of dispensing errors, and explore community pharmacists' experiences following the occurrence of a dispensing error.

Method: A mixed-methods approach was employed to conduct a series of three experiments: a quantitative and qualitative retrospective database analysis; a qualitative study of community pharmacists; and a cross-sectional survey of community pharmacists.

Results: Staff shortages, being busier than normal/high workload and fatigue/insufficient rest breaks were most frequently reported contributory factors of dispensing errors throughout this research. Type of pharmacy ownership was found to be associated with deteriorating working conditions in community pharmacy and a predictor of dispensing errors in community pharmacy.

Discussion: Increasing levels of workload, staff shortages, inadequately trained dispensary support staff, lack of rest breaks, the type of pharmacy setting and layout of the dispensary may be associated with the occurrence of dispensing errors. Increasing levels of corporatisation in community pharmacy may precipitate error-prone environments in which pharmacists perceive a high burden of responsibility towards their role. For some, this may have a considerable, and in some cases lasting impact on the pharmacist's physical and mental health.

Keywords: community pharmacy, contributory factors, dispensing errors, predictors, consequences

Acknowledgements

All praise belongs to Allah, and may there be prayers and salutations upon His Messenger, Muhammad (peace be upon him), and his noble household and companions.

An Arabic proverb from the sayings of the Prophet states: "Whosoever does not thank people (for their favours), has not thanked God."

I would like to thank Dr Joseph Bush for his constant support throughout this journey and Professor Chris Langley for his valuable input into the research. I would also like to extend my thanks to the Pharmacist's Defence Association for allowing access to their database and all of the pharmacists who took part in the research interviews or the survey.

Last but not the least, I would like to thank my parents, my husband, my family and friends for supporting me through this endeavour and always being by my side.

Contents

Chapter 1	1
Background	1
1.1 Overview	1
1.2 The Role of Community Pharmacy	2
1.3 Activities of the community pharmacist	5
1.4 The dispensing process	7
1.5 What is a dispensing error?	8
1.6 The consequences of a dispensing error	9
1.6.1 The English Legal System	9
1.6.2 Negligence	12
1.6.3 The Bolam Test and Bolitho Refinement	12
1.7 The structure of Pharmacy Regulation	13
1.8 The consequences after a dispensing error	16
1.9 Previous cases and legal precedent	16
1.10 The Pharmacists' Defence Association	24
Chapter 2	25
Literature Review	25
2.1 Introduction	25
2.2 Volume of dispensing: 1948-present	26
2.3 Incidence of dispensing errors	27
2.4 Taxonomy of dispensing errors	37
2.5 Aetiology of dispensing errors	38
2.5.1 Human Factors and Ergonomics	39
2.5.2 Human Error	40
2.5.2.1 Reason's Model of Human Error	40
2.5.2.1.1 The Person approach	41
2.5.2.1.2 The system approach	42
2.5.3 Sociotechnical Model	43
2.5.3.1 Technical Factors	44
2.5.3.1.1 Workload	44
2.5.3.1.1.1 Objective measures of workload	45
2.5.3.1.1.2 Subjective measure of workload	47
2.5.3.1.2 Interruptions and Distractions	48
2.5.3.1.3 Look-alike sound-alike drug names and packaging	51

2.5.3.1.4 Sound and Lighting	53
2.5.3.1.5 Physical environment of the dispensary	54
2.5.3.1.6 Work stress and pressures, and working conditions	55
2.5.3.1.7 Staffing and skill-mix	57
2.5.3.2 Social factors	59
2.5.3.3 Individuals factors	60
2.6 Safety culture in community pharmacy	61
2.6.1 Measuring Safety Culture and Error Identification	62
2.7 Reporting of errors	64
2.8 Outcome of dispensing errors	66
2.8.1 Outcome for patients	66
2.8.2 Outcome for pharmacists	66
2.9 Summary of literature and gaps identified	68
2.10 Aims and Objectives	69
Chapter 3	70
Methodology	70
3.1 Overview of the chapter	70
3.2 Epistemology and Theoretical Underpinnings of Scientific Research	70
3.2.1 Background	70
3.2.2 Qualitative and Quantitative Epistemology	71
3.2.3 Incompatibility Thesis	73
3.2.4 Theoretical perspective of Mixed Methods Research	74
3.2.5 Qualitative and Quantitative Research Methods	75
3.2.6 Mixed Methods Research	77
3.3 Justification for a mixed methods approach for this PhD	79
3.4 Phases of Research	80
3.4.1 Phase 1: Retrospective Database Analysis	80
3.4.2 Phase 2: Qualitative Research Interviews	81
3.4.3 Phase 3: A cross-sectional survey of community pharmacists	81
Chapter 4	82
Retrospective Database Analysis	82
4.1 Introduction	82
4.2 Background	82
4.3 Aim	85
4.4 Ethics considerations	86
4.5 Methods	86

4.5.1 Design structure	86
4.5.2 Rationale for retrospective research methods	86
4.5.3 The PDA database and the IRFs	88
4.5.4 The quantitative study	89
4.5.4.1 Sampling	89
4.5.4.2 Inclusion criteria	90
4.5.4.3 Definitions	90
4.5.4.3.1 Degree of harm	91
4.5.4.3.2 Time of day	91
4.5.4.4 Procedure	92
4.5.4.5 Analysis	93
4.5.4.6 Null Hypotheses	93
4.5.5 The qualitative study	94
4.5.5.1 Sampling	94
4.5.5.2 Inclusion criteria	95
4.5.5.3 Procedure	95
4.5.5.4 Analysis	96
4.6 Pilot study	97
4.6.1 Quantitative study	97
4.6.2 Qualitative study	98
4.7 Results	98
4.7.1 Quantitative Study	98
4.7.1.1 Nature of the dispensing error	98
4.7.1.2 Degree of harm caused to the patient	102
4.7.1.3 Pharmacist demographics	103
4.7.1.4 Pharmacy organisational and technical characteristics	105
4.7.1.5 Contributory factors	107
4.7.1.6 Summary of continuous combined variables	108
4.7.1.7 Bivariate correlation analysis	109
4.7.1.8 Cross-tabular analysis	113
4.7.2 Qualitative study	115
4.7.2.1 Sample characteristics	115
4.7.2.2 Content Analysis	120
4.7.2.2.1 Contributory Factors	120
High workload	120
Support staff shortages	123
Inadequate staff training	125

Pressure due to waiting patients/delivery driver	127
Distractions and interruptions	129
Unorganised/cluttered/small dispensary	130
Lack of rest breaks	131
Summary of theme one	132
4.7.2.2.2 Impact of the dispensing errors on the pharmacist	132
Outcome for the pharmacist	134
Summary of theme two	135
4.7.2.2.3 Learning as a result of the error	135
Reactive learning	135
Proactive learning	136
Summary of theme three	137
4.8 Discussion	137
4.8.1 Strengths and limitations	142
4.9 Conclusion	143

Chapter 5 **144**

Qualitative research interviews with community pharmacists	144
5.1 Overview	144
5.2 Background	144
5.3 Aim	147
5.4 Methods	147
5.4.1 Study design	147
5.4.2 Ethics	147
5.4.3 Semi-structured Interviews	148
5.4.4 Participants	149
5.4.5 Procedure	150
5.4.5 Analysis	152
5.5 Results	154
5.5.1 Participant characteristics	154
5.5.2 Thematic analysis	157
5.5.2.1 Working conditions in community pharmacy	157
Workload	158
Conflicting workload demands	158
Unpredictable nature of workload	164
Repetition/automaticity	165
Dispensary support staff	166

Staffing levels _____	166
Staff training _____	169
Distractions and interruptions _____	172
Work pressures and stress _____	174
Corporate culture _____	176
Professional ethics _____	176
Patient safety _____	178
Health and Safety of Pharmacists and support staff _____	179
Lack of response from the regulator _____	182
Summary of theme one _____	183
5.5.2.2 The role of the community pharmacist _____	183
Patient expectations and public perception of pharmacists' role _____	184
Staff understanding of pharmacists' role _____	186
Professional autonomy _____	187
Opinions about their job/profession _____	189
Present and future plans of community pharmacists _____	191
Summary of theme two _____	192
5.5.2.3 Experiences and attitudes of community pharmacists towards dispensing errors _____	193
Potential of making a dispensing error _____	193
Impact of a dispensing error on the pharmacist _____	196
Impact of the dispensing error on personal life _____	198
Impact of the dispensing error on the pharmacist's practice _____	200
Error prevention strategies _____	202
Managing Workload _____	202
Staffing _____	204
Managing patient expectations _____	209
Manage distractions _____	210
Sufficient and regular rest breaks _____	211
Summary of theme three _____	212
5.6 Discussion _____	212
5.6.1 Strengths and limitations of the study _____	217
5.7 Conclusion _____	217

Chapter 6 _____ 219

A Cross-sectional Survey Examining the Experiences and Attitudes of Community Pharmacists towards Dispensing Errors and Their Role in Ensuring Patient Safety during the Dispensing

Process _____ 219

6.1 Introduction	219
6.2 Methods	219
6.2.1 Study design	219
6.2.1.1 Rationale for survey methodology	220
6.2.2 Ethical approval	221
6.2.3 Development of the survey instrument	221
6.2.3.1 Occupational details	222
6.2.3.2 The dispensing process	222
6.2.3.3 Contributory factors	223
6.2.3.4 Preventing dispensing errors	223
6.2.3.5 Working conditions	224
6.2.3.6 Demographic information	224
6.2.4 Procedure	224
6.2.5 Analysis	225
6.3 Aims and Hypotheses	226
6.4 Pilot study	226
6.5 Results	227
6.5.1 Response rate	227
6.5.2 Sample characteristics	227
6.5.3 Respondents' occupational details	228
6.5.4 The dispensing of medicines and incidence of dispensing errors and near-misses	230
6.5.5 Contributory factors	233
6.5.5 Error prevention strategies	233
6.5.6 Working conditions	235
6.5.7 Cross-tabular analysis	237
6.5.8 Comparison of pharmacy ownership and contributory factors	238
6.5.9 Comparison of pharmacy ownership and error prevention strategies	240
6.5.10 Comparison of pharmacy ownership and likelihood of dispensing errors/near-misses	242
6.5.11 Comparison of pharmacy ownership and working conditions	242
6.6 Discussion	247
6.6.1 Strengths and limitations	252
6.7 Conclusion	253

Chapter 7 **255**

Discussion	255
7.1 Introduction	255
7.2 Summary of findings	256

7.2.1 Literature review	256
7.2.2 Retrospective database analysis	256
7.2.3 Qualitative study	257
7.2.4 Cross-sectional survey	258
7.3 Comparison of findings and relationship to existing literature	259
7.4 Implications for policy, practice and future research	263
7.5 Strengths and limitations	266
7.6 Conclusion	267

References **268**

Appendix 1	Study 1 data collection form	287
Appendix 2	Interview schedule for qualitative study	290
Appendix 3	Email invitation for the qualitative study	292
Appendix 4	Participant Information Sheet for qualitative study	293
Appendix 5	Volunteer consent form for qualitative study	296
Appendix 6	Email invitation for survey study	298
Appendix 7	Participant information sheet for survey	299
Appendix 8	Survey Instrument	302

List of Tables

Table 1 Community Pharmacy Contractual Framework for England and Wales	3
Table 2 Community pharmacists' time spent on different activities (Davies et al., 2014).	7
Table 3 Dispensing error cases (Appelbe and Wingfield, 2013).	20
Table 4 Terms used for the literature search	25
Table 5 Summary of incidence rates of dispensing errors from previous studies	32
Table 6 Summary of previous dispensing error research studies	34
Table 7 Comparison of Quantitative and Qualitative Approaches (Slevitch, 2011).	72
Table 8 Categories of degree of harm (National Patient Safety Agency, 2011)	91
Table 9 Time categories for parts of the day	91
Table 10 Frequencies of dispensing error types	99
Table 11 Frequencies of dispensing errors according to time in hours	99
Table 12 Frequencies of how pharmacists became aware of the dispensing error	100
Table 13 Summary of results for the outcome and degree of harm caused	102
Table 14 Summary of pharmacy organisational characteristics	107
Table 15 Contributory factors of the dispensing errors	108
Table 16 Summary of combined continuous variables	109
Table 17 Summary of bivariate correlation analyses of a range of factors against SHPP	110
Table 18 Number (expected count) of pharmacists performing the final accuracy check by a range of factors	114
Table 19 Sample characteristics	116
Table 20 Thematic analysis of IRFs	120
Table 21 Stages of data analysis in the Framework approach (Pope et al., 2000)	153
Table 22 Sample characteristics	155
Table 23 Emergent themes and sub-themes	157
Table 24 Survey respondents' background in community pharmacy	229
Table 25 Survey respondents' full-time/part-time working basis	229
Table 26 Survey respondents' occupational details	229
Table 27 Survey respondents' type of pharmacy ownership of their pharmacy premises	229
Table 28 Descriptive statistics of respondents' working hours per day and the number of dispensing errors they were aware of in the past six months	231
Table 29 Mean number of hours spent on various work activities	231
Table 30 Average number of prescription items dispensed during an average working day	231
Table 31 Respondents' opinions of the occurrence of dispensing errors and near-misses	232
Table 32 Respondents' opinions of dispensing error and near-miss likelihood	232
Table 33 Frequencies of the working conditions variable	236

<i>Table 34 Cross tabulation of the gender variable</i>	238
<i>Table 35 Cross tabulation of the age variable</i>	238
<i>Table 36 Differences in contributory factors between different pharmacy ownerships</i>	240
<i>Table 37 Differences in error prevention strategies between different pharmacy ownerships</i>	241
<i>Table 38 Differences in perceptions of error likelihood between different pharmacy ownerships</i>	242
<i>Table 39 Differences in working conditions between different pharmacy ownerships</i>	246

List of Figures

Figure 1 History of pharmacy regulating committees	15
Figure 2 The number of prescriptions dispensed in community pharmacy in England 1993/94-2014/15 (Health and Social Care Information Centre, 2016b)	27
Figure 3 The number of registered pharmacists in the UK (General Pharmaceutical Council, 2015)	28
Figure 4 The Swiss Cheese Model of system failure (Anon, 2017)	43
Figure 5 A bar chart showing the types of dispensing errors	100
Figure 6 A bar chart the part of day during which the dispensing errors took place	101
Figure 7 A bar chart showing the times of day during which the dispensing errors took place	101
Figure 8 A bar chart showing the degree of harm arising from the dispensing errors	102
Figure 9 A bar chart showing the gender of pharmacists	104
Figure 10 A bar chart showing the employment status of pharmacists on the day of the dispensing error	104
Figure 11 A bar chart showing the type of pharmacy where dispensing errors took place	106
Figure 12 A bar chart showing the computer system used on the e day of the dispensing error	106
Figure 13 Monthly prescription volume vs SHPP	111
Figure 14 Total number of hours worked on the day of error vs SHPP	111
Figure 15 Total number of dispensary support staff present at the time of error vs SHPP	112
Figure 16 Rest break taken per hour worked (mins) vs SHPP	112
Figure 17 Gender of pharmacists	228

List of Abbreviations

ACT	Accredited Checking Technician
ADS	Automated Dispensing System
CP	Community Pharmacist
DOH	Department of Health
ETP	Electronic Transfer of Prescriptions
GP	General Practitioner
GPhC	General Pharmaceutical Council
HFE	Human Factors and Ergonomics
HRO	High Reliability Organisation
IRF	Incident Report Form
LASA	Look-alike Sound-alike drug
MaPSaF	Manchester Patient Safety Framework
MCA	Medicines Counter Assistant
MHRA	Medicines and Healthcare products Regulatory Agency
MUR	Medicines Use Review
NASA-TLX	National Aeronautics and Space Administration Task Load Index
NHS	National Health Service
NPA	The National Pharmacy Association
NPSA	National Patient Safety Agency
NRLS	National Reporting and Learning Scheme
OTC	Over-the-Counter supply of medicines
PDA	Pharmacists' Defence Association
PIA	Pharmacy Insurance Agency
PMR	Patient Medication Record
RCA	Root Cause Analysis
RPS	Royal Pharmaceutical Society
RPSGB	Royal Pharmaceutical Society of Great Britain
S/NVQ	Scottish/National Vocational Qualification
SAQ	Safety Assessment Questionnaire
SHPP	Summed Harm Per Prescription
SOP	Standard Operating Procedures
SWAT	Subjective Workload Assessment Technique
UK	United Kingdom
US	United States

Chapter 1

Background

1.1 Overview

Dispensing is one of the core functions of community pharmacy despite various attempts to shift the activity of community pharmacists towards a more patient-centred clinical role (Harding and Taylor, 2015). Dispensing refers to all the processes involved in the preparation, packaging, labelling and record keeping of medicines from the receipt of the prescription to the point of supply to the patient or representative (Harding and Taylor, 2015).

According to the English-based National Patient Safety Agency¹ (NPSA), of the 72,482 medication incidents reported by all healthcare settings and across all stages of the medication process, from prescribing through to preparation/dispensing to administration and monitoring, 4,872 (almost 7%) originated from the dispensing process within community pharmacies (National Patient Safety Agency, 2009). Furthermore, previous research suggests that dispensing errors² occur at a rate of 0.04%-3% in community pharmacy (Ashcroft et al., 2005, Franklin and O'Grady, 2007, James et al., 2009). Community pharmacists are well placed to play a pivotal role in maintaining and ensuring patient safety. However increasing workload as a result of role expansion from the contractual changes of 2005 as well as organisational pressures to meet targets and various other human and environmental factors may adversely affect pharmacist performance and thus increase the likelihood of errors

¹ The NPSA - a body of the Department of Health that aims to reduce risks to patients and improve safety. NATIONAL PATIENT SAFETY AGENCY. 2017. Available: <http://www.npsa.nhs.uk/> [Accessed 31 October 2017].

² Throughout this thesis, the term 'dispensing error' will be used to describe an error that occurs during the dispensing process which is unrecognised before the drug reaches the patient.

occurring (Gidman, 2011, Gidman et al., 2007, Hassell et al., 2011). The consequences for the pharmacist after the occurrence of a dispensing error can vary from an investigation by the employer or the local National Health Service (NHS) body to civil or even criminal proceedings. For the patient however, the consequences of the dispensing error can vary from no harm caused, to severe harm, and in some cases, death.

1.2 The Role of Community Pharmacy

Pharmacy is considered the third largest health profession globally (Mossialos et al., 2015). In England, it has been claimed that around 1.6 million people visit a community pharmacy every day, of which 1.2 million do so for health-related reasons (Pharmaceutical Services Negotiating Committee, 2017a). It has been estimated that community pharmacies see over 90% of the UK population annually (Anderson, 2000). This is partly attributable to its accessibility (89% of the population in England can access a community pharmacy within 20 minutes) and convenience (community pharmacies have longer opening hours and work on a no-appointment basis). Thus community pharmacy is ideally placed to play a key role in promoting health and ensuring safety (Mossialos et al., 2013, Todd et al., 2014). However, at present community pharmacy is not well integrated into the healthcare domain, which means that its position as a health profession is not being utilised to its full potential (Blenkinsopp et al., 2009, Bond et al., 2008, Saramunee et al., 2014).

In the UK, community pharmacies operate as privately owned businesses, providing NHS pharmaceutical services as independent contractors (Bush et al., 2009, Noyce, 2007). In England and Wales, these services are provided under the 2005 community pharmacy contractual framework, whereas slightly different arrangements apply to Scotland and Northern Ireland (Noyce, 2007). In England and Wales, services are divided into three tiers; essential, advanced and locally-commissioned enhanced services (see Table 1). The provision of essential services is the minimal requirement of the contract, and thus these are provided by all contractors.

Table 1 Community Pharmacy Contractual Framework for England and Wales

Level of service	Services provided	Offered by
Essential services	Dispensing medicines Dispensing appliances Repeat dispensing Disposal of unwanted medicines Public health Signposting Support for self-care Clinical governance	Provided by all pharmacy contractors as part of the NHS community pharmacy contractual framework
Advanced services	Medicines Use Review (MUR) and Prescription Intervention Service New Medicines Service (NMS) Appliance Use Review (AUR) Service Stoma Appliance Customisation (SAC) service	Community pharmacies can choose to provide these services as long as they meet accreditation requirements
Locally commissioned services (previously known as enhanced services)	Out of hours access to medicines Patient Group Directions Seasonal Influenza Vaccination Sharps disposal Social prescribing Stop smoking Supplementary prescribing by pharmacists Supervised administration Tuberculosis Vaccination Services Vulnerable patients Weight management Service Winter Ailments Alcohol Screening and brief Intervention Anticoagulant Monitoring Service Asthma Atrial Fibrillation Blood-borne virus screening Cancer Care homes Carer (carer-friendly pharmacies) Chlamydia screening and treatment Coeliac disease Community Equipment Service COPD Dementia Diabetes Domiciliary support Emergency Hormonal Contraception Fall prevention Gluten-free foods supply Healthy start vitamins Hypertension Independent prescribing pharmacist Long term conditions management Medication Review Medicines Assessment & Compliance Support Medicines Optimisation Mental Health Minor Ailment Scheme Needle & Syringe Exchange NHS Health Check On demand availability of specialist drugs	Commissioned locally by local authorities, clinical commissioning groups and NHS England in response to the needs of the local population

Advanced and enhanced services however are optional. The provision of advanced and enhanced services necessitates the pharmacist providing the service to be accredited by a post registration qualification and the pharmacy premises to meet the requirement related to the arrangement of confidential consulting facility (Hassell et al., 2011).

The contractual changes of 2005 came about as a result of increasing recognition of community pharmacy being the most under-utilised resource for health improvement and placed a greater emphasis on the provision of clinical services rather than the dispensing of medicines (Department of Health, 2003). In order to support the proposed changes, the funding structure was adjusted to reward pharmacists for the quality of services provided rather than the volume of prescriptions dispensed, by increasing the level of reimbursement for the provision of clinical services (Department of Health, 2000). The majority of community pharmacists supported the new frameworks and in doing so, sought to expand their role. However, research suggests that the introduction of the new contract has been associated with a large increase in workload accompanied with stress, work pressures and decreased job satisfaction (Bond et al., 2008, Gidman, 2011, Hassell et al., 2011).

Dispensing continues to remain the predominant feature of the pharmacist's role (Eden et al., 2009). This may be attributable to a sustained increase in the number of prescriptions dispensed in community pharmacy in England annually (Health and Social Care Information Centre, 2016b). It could be argued that the workload associated with a high prescription volume presents as a barrier in allowing pharmacists to spend time on other clinical activities. This may be reflected in the steady uptake of the Medicines Use Review (MUR) – an advanced service, and locally commissioned enhanced services, which have only ever been minimal (Bond et al., 2008, Health and Social Care Information Centre, 2016b). Such increase in the levels of service provision suggests that pharmacists may be coping with a larger work burden. Previous research has suggested a negative influence of workplace factors such as high workload, stress, lack of resources and reduced job satisfaction on the

performance of individuals (Eden et al., 2009, Gidman, 2011, McCann et al., 2010, McCann et al., 2009b). If developments in the practice of community pharmacy are associated with negative influences of workplace factors on performance, the ability of pharmacists to deliver services safely may be compromised, in particular the dispensing of medicines (McCann et al., 2009a). In recent years, there has been a growing interest in the study of dispensing errors, however, most studies have attempted to quantify the rate of dispensing error occurrence and identify the causes and types of errors. Research to date has been unable to provide a robust assessment of the role that community pharmacists play in ensuring accuracy and clinical appropriateness during the dispensing process, as well as the changes that pharmacists may be making to their dispensing practices in order to manage additional work. This project will investigate the nature and outcome of dispensing errors, possible explanations of error occurrence as well as the impact of dispensing errors on the pharmacist's practice.

1.3 Activities of the community pharmacist

There has been a substantial change in the nature of community pharmacy during the last century (Savage, 1999). At the beginning of the twentieth century, pharmacists' duties primarily lay in the dispensary where they utilised their knowledge and skills in the compounding and preparation of medicines and this continued up until the industrialisation of the pharmaceutical industry in the 1970s (Harding and Taylor, 2015, Savage, 1999). After this, whilst dispensing continued to be the core function of the pharmacy profession, the process of dispensing was deskilled to simple, repetitive tasks (Savage, 1999). In response to the Nuffield Report of 1986, which suggested that pharmacists' skills could be better utilised, health policy began to emerge which promoted the delegation of dispensing to appropriately trained staff in attempt to free up the pharmacist's time for the provision of pharmaceutical services (Savage, 1999). In the last decade, government policies, as well as advocacy from professional bodies within pharmacy, have further attempted to shift and extend the pharmacist's role away from dispensing-focussed activities towards patient-centred care (Davies et al., 2014). However a comparison of two work sampling studies from 1993 and 2013

suggests that policy changes have failed to achieve an appreciable change towards this extended role (Davies et al., 2014, Savage, 1999).

Davies et al. (2014) used an observational, fixed-interval work sampling technique to record the activities of ten community pharmacists in London. Trained observers recorded the activity of each pharmacist every minute for four hours each day over the course of two weeks and classified the activity into one of eighteen predetermined categories. The results (see Table 2) revealed that pharmacists spent almost two fifths of their time (median 39.6%) on prescription related matters, including assembly and labelling of products as well as prescription monitoring and appropriateness. Provision of advanced and locally commissioned services accounted for the least proportion of pharmacists' time (median 3.2%). The amount of time spent on counselling (median 12.4%) remained the same as previously cited studies, despite a substantial increase in prescription volumes (Rutter et al., 1998). This may suggest that pharmacists are spending relatively less time per prescription counselling patients than they did in the past. Furthermore, the study found that pharmacists spent 46% of their time on professional tasks, 28% on semi-professional and 20% on non-professional tasks which is in line with previous UK research (McCann et al., 2010). Contrary to expectation, this study did not find any substantial differences between the working practises of pharmacists at the time of the study and twenty years previously suggesting that the contractual changes of 2005 have had little impact on pharmacy practice. Savage (1999) conducted an observational fixed-interval work sampling study on fifteen pharmacies in London during 1993. The results showed that pharmacists spent the majority of their time on dispensing related tasks and only a small proportion of their time was spent on health-related customer communication.

The results of these two studies suggest that dispensing remains the core function of the pharmacy profession and the amount of time spent in the provision of clinical and pharmaceutical services is minimal. The remuneration system presents a barrier to role expansion as dispensing volume continues to be the primary determinant of contractor income. Thus it appears that contractors of pharmacy services may be keen to hold onto the dispensing function in pursuit of financial income.

Table 2 Community pharmacists' time spent on different activities (Davies et al., 2014).

Activities	Median
Prescription related matters	39.6%
Non-counselling communication	15.1%
Counselling	12.4%
Health administration	8.7%
Premises	8.6%
Rest, waiting and personal time	8.6%
Services	3.2%

1.4 The dispensing process

The industrialisation of pharmaceutical products, which began after the Second World War, resulted in the increased availability of pre-formulated and pre-packed medicines, reducing the use of pharmacists' technical skills of compounding and formulating (Richardson and Pollock, 2010, Savage, 1999). Thus over time, the dispensing process has been deskilled to a series of simple manipulative tasks requiring little intellectual input from the pharmacist, thereby reducing the time taken to dispense a prescription (Savage, 1999).

The modern dispensing process is a combination of mechanical and judgemental components involving several distinctive stages (Hattingh et al., 2009, Remington, 2006). Mechanical components of dispensing are those that are technical in nature and include the assembly, labelling and supply of medicines as well as the appropriate record keeping of these processes (Hattingh et al., 2009). The assembly stage involves selecting the correct product, in the correct dosage form, strength, and quantity as requested by the prescriber. In the vast majority of cases, original packs are supplied; however, where the quantity requested is different to that contained within the original pack, blister packs need to be cut, unit doses counted or liquids poured such that the quantity supplied to the patient (or his/her representative) matches the quantity ordered on the prescription. The label generation stage of the dispensing process usually involves the transfer of information from the prescription into the dispensing software and once produced, it must be attached to the correct medication. Given relevant training and experience however, the abovementioned tasks can be delegated to members of the dispensary staff such as dispensing

technicians and Accredited Checking Technicians (ACTs) and need not be completed exclusively by the pharmacist.

Conversely, judgemental components of the dispensing process, such as the clinical and legal check, final accuracy check and patient counselling, are cognitive in nature, requiring the pharmacist to use their knowledge, skills and expertise to make a correct interpretation and evaluation of the prescription (Hattingh et al., 2009). During the clinical check, the safety and appropriateness of the medicine for the patient is assessed. The legal check ensures that the required particulars of the prescription are present (e.g. patient name, signature of the prescriber, date of prescription) and correct (e.g. in the case of Schedule 2 and 3 controlled drugs, the prescription is valid for only 28 days from the date of prescription). If problems or ambiguities exist, sufficient measures must be taken to address any issues before making a decision to dispense the medication. The accuracy checking stage is often advocated as an essential step in preventing errors as previous research suggests that 90-95% of errors are detected during an independent accuracy check by a pharmacist or a technician (Anto et al., 2013). Finally, in the patient counselling stage, the pharmacist provides advice and information relating to the safe and effective use of the medicine. Having considered the stages involved in the dispensing process, it is important to note that in the case of harm arising as a result of an error, the pharmacist would share responsibility with the prescriber, even if the error originated in the prescribing process. This is because it would be viewed that the failure of the pharmacist to exercise proper professional judgement during the dispensing process allowed the error to be carried through the dispensing stage and reach the patient (Harding and Taylor, 2015).

1.5 What is a dispensing error?

A dispensing error can be described as an error that occurs during the dispensing process which is unrecognised before the drug reaches the patient (James et al., 2009, Knudsen et al., 2007a). In previous research, a variety of terms have been used to describe dispensing errors. These include content errors which comprise all errors

involving incorrect content such as incorrect drug, strength, form, added or missing dose units and expired medication, and labelling errors, which comprise incorrect drug name, form, strength, quantity, dosage instructions and patient name. Similarly, an error that takes place during the dispensing process but does not reach the patient can be defined as a 'near-miss' (James et al., 2009, Knudsen et al., 2007a). Slight variations of these definitions exist. It is noteworthy that a substantial proportion of the literature is focussed on medication errors in general - that is any error which occurs from the point of prescribing to the point of supplying the medicine to the patient – as opposed to having a direct focus on dispensing errors in the pharmacy setting (Mangino, 2004). Furthermore, there is an inconsistency in the terminology whereby some studies use the term 'medication error' as one that is related to the incorrect supply or administration of medication whilst others have also included adverse events/errors and medical errors (Mangino, 2004).

1.6 The consequences of a dispensing error

Before reviewing the types and causes of dispensing errors, the consequences after a dispensing error, both for the pharmacist and the patient, will be discussed. In order to inform the discussion, a brief overview of the English legal system as well as the structure of pharmacy regulation will be presented. This will be followed by some of the high profile cases which shape the pharmacy profession today, and are likely to impact future development.

1.6.1 The English Legal System

The basic structure of the English legal system is founded upon two main divisions; statute law and common law. The key difference between these is that statute law is enacted through the parliament in the form of legislation or statutes via Acts of the Parliament which form primary legislation whereas common law is not (Appelbe and Wingfield, 2013, Slapper and Kelly, 2015).

Acts of particular relevance to pharmacy practice include the Medicines Act 1968, the Misuse of Drugs Act 1971 and the Poisons Act 1972. Any Regulations and Orders

subsidiary to the Acts also come under statute law and collectively form Statutory Instruments and are secondary legislation (Appelbe and Wingfield, 2013). The main difference between primary legislation and secondary legislation is that the former is examined and debated in the House of Commons and the House of Lords and is then forwarded to Royal Assent. Secondary legislation on the other hand does not require debate in the Houses or royal assent before being passed. Whereas statute law is the written law created by the parliament in the form of legislation, common law is the unwritten law that has been created through the judicial decisions that have been made in the past (Slapper and Kelly, 2015). Common law is case-centred and judge-centred, meaning that decisions made on previous cases form a precedent and can be used to help make decisions on similar cases in future, thereby allowing a discretionary ad-hoc, pragmatic approach (Slapper and Kelly, 2015).

Criminal law, administrative law and professional law are all types of statute law, whereas civil law is a type of common law. Decisions made on civil cases are based primarily on the precedence that has been set by previous cases.

The essence of criminal law is to enforce the standards of behaviour which the State requires to be met at all times. Civil law however, relates specifically to relationships between individual citizens. It is based on the basic assumption that each individual citizen owes a duty of care to another. The essence of civil law is that it gives individuals the right to gain compensation from another person for the damages as a result of their 'wrong' or 'tort' (Gillespie and Weare, 2017). The State provides an overall legislative framework that empowers individuals to operate their rights and thus settle disputes that may arise between individuals or citizens (Slapper and Kelly, 2015). In relation to pharmacy, tort can constitute not just negligence, but can also be a breach of confidentiality or defamation (Appelbe and Wingfield, 2013). If the occurrence of a dispensing error proceeds to civil litigation, the pharmacist would have to provide evidence that the duty of care that he owed to the patient was in fact fulfilled to avoid a charge of clinical negligence.

A basic difference between criminal and civil law is that criminal law is founded upon the assumption that the act of offence constitutes the mental (*mens rea*) and physical (*actus reus*) elements, whereby an intention to commit the wrongdoing is present as well as the physical act itself (Slapper and Kelly, 2015). Civil law does not require the presence of intent or 'the guilty mind'. It is essential to appreciate this key difference in order to be able to identify the routes taken to address the actions of the pharmacist in the case of dispensing errors. Moreover, a difference also lies in the 'burden of proof' required for criminal and civil cases. 'Burden of proof' means the level of evidence required to prove the facts of the case (Slapper and Kelly, 2015).

The burden of proof in criminal proceedings is 'beyond all reasonable doubt', which the prosecution would have to prove against the defendant (Slapper and Kelly, 2015). In essence, 'beyond all reasonable doubt' means that there can be no other reasonable explanation for the facts of the case other than that the defendant is guilty of the alleged crimes. The burden of proof in civil cases is on the balance of probabilities; a burden lower than that employed in criminal cases (Slapper and Kelly, 2015). This essentially means that if the claimant can prove that the claim is more likely to be true than not, he/she would be liable for the damages of the claimant and as such would have to compensate for the loss or harm resulting from his/her wrongdoing (Slapper and Kelly, 2015). Due to the fact that the burden of proof is much greater for criminal proceedings, the odds of success are greater if brought under civil law as opposed to criminal law. Moreover, the application of 'strict liability' in criminal cases may be necessary to impose strict compliance of the law, all with an overall aim of preventing harm at the expense of harsh convictions.

In strict liability offences, proof of the *mens rea* or 'guilty mind' is not a necessary requirement. In relation to pharmacy, a mere dispensing error would be considered a criminal offence, even though there was no intention to do anything unlawful or if no harm was caused as a result. This was seen in the case of *Pharmaceutical Society of Great Britain v Storkwain Ltd.* (1986). In this example, the pharmacist was unaware that the presented prescriptions were forged, and as such made the supply of drugs.

Despite appeal against the decision made in the Court of Appeal, the House of Lords confirmed the decision (Appelbe and Wingfield, 2013).

1.6.2 Negligence

The tort of negligence is derived from civil law and concerns the civil liability or legal obligations arising from the 'wrongs' or 'tort' of one individual towards another. An aggrieved party can sue for compensation of damages that resulted from the 'wrong' of the third party (Appelbe and Wingfield, 2013). Of the various types of tort under civil law, the 'tort of negligence' is most often seen in cases of professional negligence (Appelbe and Wingfield, 2013).

Negligence as an established tort originates from the House of Lords ruling in the case of *Donoghue v Stevenson* in 1932, in which a claim was made against a drinks manufacturer when a decomposed snail was found in a bottle of ginger beer (Jones, 2000). This case enabled the courts to develop the concept of 'duty of care', which now forms the basis of clinical negligence cases. The courts must weigh and balance the facts of the case in order to identify whether the defendant could reasonably foresee that the claimant is likely to be injured or suffer harm by his or her actions or conduct. In order to establish negligence, that claimant must prove the following:

- The defendant owed him a duty of care.
- The defendant was in breach of that duty.
- That he/she suffered damages as a result of that breach.
- That the damage was reasonably foreseeable in all the circumstances.

(Merrills and Fisher, 2013)

1.6.3 The Bolam Test and Bolitho Refinement

The legal standard of care is that of a person of ordinary prudence, and in the case of a particular skill, it is that of a person undertaking work of a similar nature (Merrills and Fisher, 2013). Up until 1957, decisions ultimately depended on how the juries

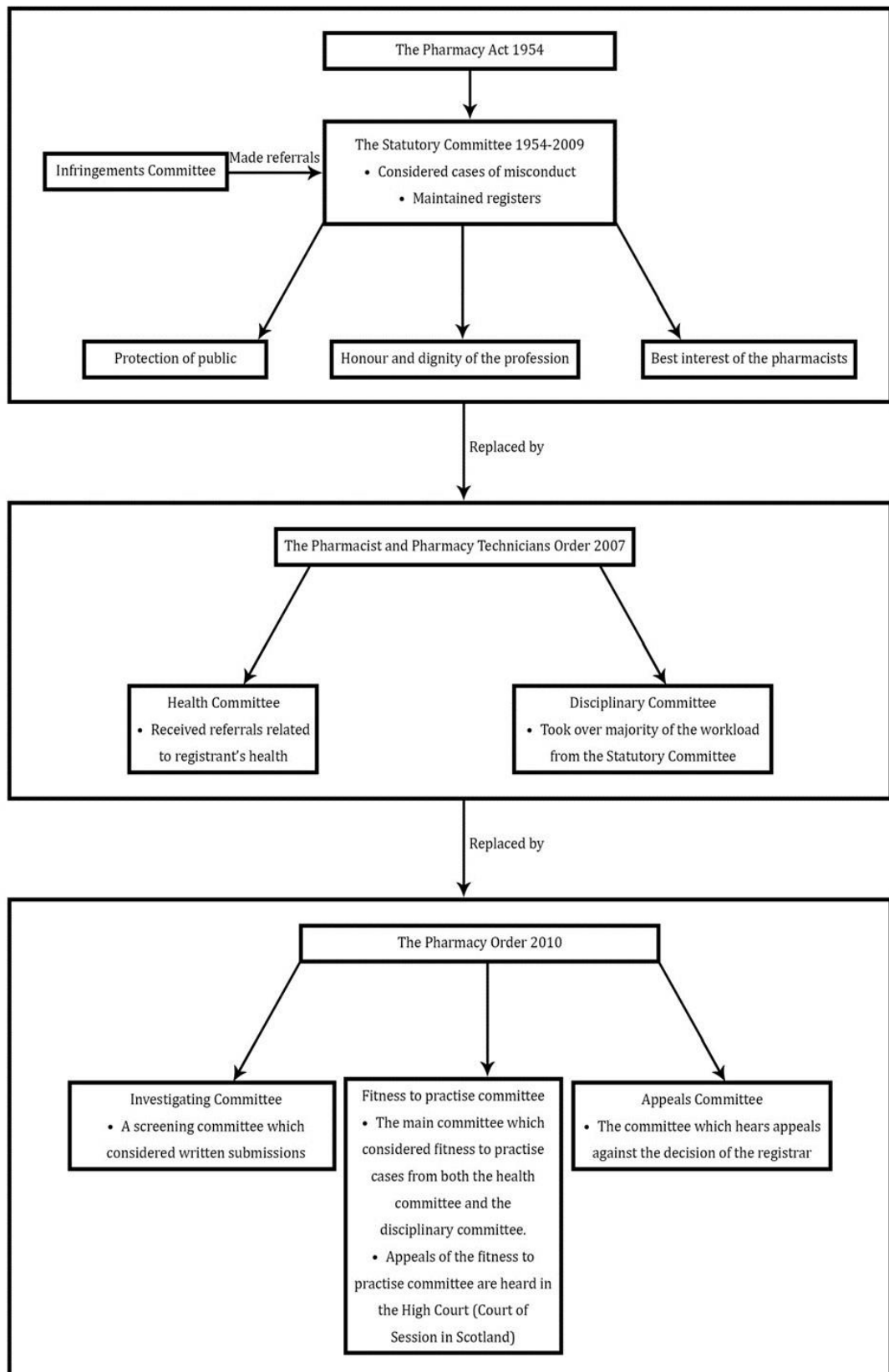
interpreted the requirements of the medical practice (Teff, 1998). However, the case of *Bolam v Friern Hospital Management Committee* constrained this norm and directed that evaluation of conduct and standard of care be carried out by medical experts. This became known as the Bolam Test, in which expert professional opinion is used to assist the court in determining whether the defendant met the required standard of care in the given circumstances. The Bolam Test continues to play an important role in negligence cases, however the case of *Bolitho v City and Hackney Health Authority* advocated a need to scrutinise expert opinion and only accept it if it were deemed logical and reasonable (Teff, 1998). Whilst the chance of expert opinion being illogical is highly unlikely, *Bolitho* enables the courts to judge a practice to be negligent despite a responsible body of knowledge approving it, if in the opinion of the courts, it is not logically supportable. Thus practitioners cannot rely solely on the Bolam test as a defence (Jones, 2000).

1.7 The structure of Pharmacy Regulation

The European Community Directive 2001/83/EC and the Medicines Act 1968 provide the overall legislative framework surrounding the safe and effective use of medicines for human use (Appelbe and Wingfield, 2013). Much of the Medicines Act 1968 has been amended and is now largely superseded by The Human Medicines Regulations 2012 (Appelbe and Wingfield, 2013). The legislation is enforced through the professional regulatory body for pharmacy – the General Pharmaceutical Council (GPhC) (Appelbe and Wingfield, 2013). The Royal Pharmaceutical Society of Great Britain (RPSGB), which was formed in 1841, remained the representative and regulatory body for the pharmacy profession until 27th September 2010. Subsequently, in order to establish a consistency in the core functions across the regulators of other health professions, the regulatory responsibility of the RPSGB was passed to the GPhC and the representative function was passed to an independent body; the Royal Pharmaceutical Society (RPS) (Appelbe and Wingfield, 2013, Langley, 2013). Empowered by legislation, the GPhC regulates the pharmacy profession through the establishment of committees which consider cases of misconduct (Langley, 2013). Figure 1 below illustrates the history of the committees

and their purposes. Regulation of pharmacists in the past has been of a reactive nature, whereby the regulator took action when the event had taken place, rather than a proactive nature which would prevent issues arising (Langley, 2013). However, the Pharmacy and Pharmacy Technicians Order 2007 initiated a shift away from reactive regulation by enabling the Disciplinary Committee to issue an interim order. In such cases, a registrant's health is deemed to be a risk to the public, even when an actual incident related to patient or public safety has not have taken place (Langley, 2013). The establishment of the three statutory committees under the Pharmacy Order 2010 has further attempted to shift regulation to a proactive basis in order to effectively enhance patient safety (Langley, 2013).

Figure 1 History of pharmacy regulating committees



1.8 The consequences after a dispensing error

The consequences after the occurrence of a dispensing error can vary from no response to an investigation by the employer or the local NHS body, a civil or, in the most serious cases, criminal proceedings. The route taken depends on the degree of harm caused. For the majority, the error will be identified before any harm is caused and no further action will be taken (Langley, 2013). However in cases where the dispensing error has resulted in some degree of harm to the patient, the patient can pursue a civil claim to gain some form of financial compensation and/or report the matter to the professional regulator, the GPhC (Langley, 2013). Most of the dispensing incidents reported to the GPhC do not progress to criminal or civil proceedings due to the 'Threshold Criteria', which is based upon the seven principles as set out in the GPhC's 'Standards of Conduct, Ethics and Performance' (Langley, 2013). The GPhC stipulates that these standards be complied with by all pharmacists. The threshold criteria are designed to allow minor cases to be dealt with advice and guidance through the inspectorate. It is only the serious or potentially serious cases, which have failed to demonstrate adherence to the seven principles that are referred to the Investigating Committee (Langley, 2013). If an appeal is made against the decision of the statutory committee, the case may progress to the legal court system and be heard in the High Court (Langley, 2013). In the instance that the degree of harm is so severe that the patient dies, a criminal investigation may be necessary before referral to the pharmacy regulator (Langley, 2013). The pharmacist may be charged with gross negligence manslaughter or for breach of pharmacy legislation such as the Medicines Act 1968, the Human Medicines Regulations 2012, the Poisons Act 1972 and the Misuse of Drugs Act 2001 (Langley, 2013).

1.9 Previous cases and legal precedent

Perhaps the most high profile legal case involving a community pharmacist is that of Elizabeth Lee (Langley, 2013). At the time of the incident, Lee was working as a locum (self-employed freelance pharmacist). She was presented with a prescription for prednisolone. Instead, she supplied propranolol but the packaging of the dispensed

medication was labelled as prednisolone. Upon taking the medication, the patient collapsed and later died due to cardiac arrest. The pharmacist was charged against section 64, clause 1 of the Medicines Act 1968 for supply of an incorrect product which states "no person shall, to the prejudice of the purchaser, sell any product which is not of the nature or quality demanded by the prescriber" and also section 85, clause 5b for attaching the wrong label which states "without prejudice to the proceeding provisions of this section, no person shall, in the course of a business carried on by him, sell or supply, or have in his possession for the purpose of sale or supply, a medicinal product of any description in a container or package which is labelled or marked in such a way that the container or package is likely to mislead as to the nature or quality of the product or as to the uses or effects of medicinal products of that description". Although the conviction under section 85(5b) of the Medicines Act 1968 was later rebutted as the court ruled that offences under section 85(5b) cannot be applied to employed or self-employed pharmacists (Gosney, 2010), the conviction under section 64(1) was upheld. The fact that the latter conviction remained has set precedent; pharmacists can continue to face criminal prosecution in the event of a single, inadvertent error. The Lee case however, is not the first where a pharmacist has been tried for manslaughter. The 'Peppermint Water' case of 1998 was the first time in ninety years which involved the criminal prosecution of a pharmacist. However, for both the Lee case and the 'Peppermint Water' case, the charges for gross negligence manslaughter were later dropped and subsequently brought against section 64(1) of the Medicines Act 1968.

Section 64 of the Medicines Act 1968 is commonly used to instigate criminal proceedings against pharmacists in the event of single inadvertent errors (Wardle, 2017). More recently the case of Martin White, strikingly similar to that of Elizabeth Lee, also made it to national headlines (Cox, 2016). Like Lee, White inadvertently supplied propranolol instead of prednisolone to a 67 year old patient, who subsequently took the medication and died (Wardle, 2017). Once again, Mr White was convicted under section 64 of the Medicines Act 1968 for supplying a product which was not of the nature or quality prescribed (Wardle, 2017). In December 2016, Mr White was sentenced to four months in prison suspended for two years (Cox, 2016).

Similarly a prosecution under section 64 of the Medicines Act 1968 was also seen in the Prestatyn case in 2009 (Appelbe and Wingfield, 2013). Concerns have been voiced about the trend of using the Medicines Act to prosecute pharmacists after gross manslaughter cannot be established (The Pharmacists' Defence Association, 2010b). Since section 64 of the Medicines Act 1968 is a strict liability offence, it is considered a criminal offence irrespective of it being an unintentional error. This means that pharmacists can face criminal prosecution in the event of an inadvertent one-off dispensing error.

It has been argued that the application of the Medicines Act 1968 for inadvertent one-off dispensing errors fits uneasily with modern day pharmacy (The Pharmacists' Defence Association, 2010a, Wardle, 2017). Originally it is thought that the wording of section 64 was borrowed from food legislation post-war and included in the Medicines Act 1968 to prevent adulteration of medicinal products (Wardle, 2017). This was a time when products were largely extemporaneously prepared (Wardle, 2017). Given that extemporaneous dispensing has now become a rare aspect of a pharmacists' practice, application of section 64 to prosecute unintentional errors appears unnecessary, especially given that there are other legal mechanisms that can be used to prosecute cases where there is a criminal intent for example, the Consumer Act and the General Products Safety legislation (The Pharmacists' Defence Association, 2010a). Furthermore, it may be argued that the criminalisation of dispensing errors poses not just a rebound threat to patient safety (as pharmacists may be unwilling to admit errors) but it also fits uneasily with a vision to expand the pharmacist's role (Wingfield, 2014). Contrary to other health professions, pharmacy remains the only healthcare profession in which one-off errors that result in no harm to the patient are considered criminal offences (House of Commons, 2009, Langley, 2013). In response to the Elizabeth Lee case, the potential criminal conviction of pharmacists for dispensing errors has been the subject of debate for pharmacy bodies and the Medicines and Healthcare products Regulatory Agency (MHRA) (Appelbe and Wingfield, 2013). After an ongoing drive within the profession to decriminalise single dispensing errors, a legal defence is now available for inadvertent errors made by community pharmacists and pharmacy technicians from April 2018 (House of

Commons, 2009, Langley, 2013, Pharmaceutical Services Negotiating Committee, 2018).

Table 3 below outlines some of the most prominent cases of negligence in pharmacy and the key issues raised.

Table 3 Dispensing error cases (Appelbe and Wingfield, 2013).

Year	Case	Details	Charges/judgements	Award/sentence/fine	Key issues
1982	The 'Migril' case <i>Dwyer v Roderick</i> (1983)	<ul style="list-style-type: none"> A woman suffering from a migraine negligently prescribed an overdose of Migril on prescription. Pharmacist failed to spot the error and query it. Patient suffered gangrene in both feet requiring extensive surgery. 	<ul style="list-style-type: none"> Judge found both the pharmacist and the doctor to have acted negligently. 	<ul style="list-style-type: none"> £130,000 Owner of the pharmacy (admitted negligence) liable for 45% of damages. 	<ul style="list-style-type: none"> It is a legal and professional responsibility of the pharmacist to verify and question a prescription and not be deterred by any adverse response of the prescriber.
1988	The 'Daonil' case <i>Prendergast v Sam and Dee Ltd, Kozary and Miller</i> (1989)	<ul style="list-style-type: none"> Patient prescribed Amoxil amongst other items on prescription. Pharmacist misread Amoxil as Daonil (glibenclamide-anitdiabetic). Patient suffered irreversible brain damage 	<ul style="list-style-type: none"> Judge found the word Amoxil on prescription capable of being read as Daonil Other factors on prescription should have alerted the pharmacist. Chain of causation from poor handwriting to wrong drug being supplied was not broken. 	<ul style="list-style-type: none"> £100,000 All three defendants, the pharmacy company (Sam and Dee Ltd), the pharmacist (Kozary) and the doctor (Miller) found liable. 25% of damages apportioned between the doctor and 75% shared between the pharmacy company and the pharmacist. 	<ul style="list-style-type: none"> Pharmacists must not dispense mechanically and must pay attention to other factors that can alert them of unusual prescriptions.

1998	The 'Peppermint Water' case	<ul style="list-style-type: none"> • Patient (a baby) prescribed peppermint water solution. • Extemporaneously prepared in a community pharmacy by a pre-registration pharmacist. • Made up using twenty times the required quantity of chloroform <ul style="list-style-type: none"> • Patient died 	<ul style="list-style-type: none"> • Initially pre-registration trainee and supervising pharmacist charged with manslaughter. • Crown Prosecution Service agreed to drop the charges. 	<ul style="list-style-type: none"> • Both pleaded guilty • Pharmacist fined £1000 • Pre-registration trainee fined £750 	<ul style="list-style-type: none"> • Single dispensing errors associated with death of a patient may be prosecuted for manslaughter. • Non-registered individuals may also be prosecuted • Formal action against the superintendent did not take place.
2000	The 'Epilim' case <i>Shipman v Mayfair Chemists (Hyde) Limited.</i>	<ul style="list-style-type: none"> • Negligently written prescription for Epilim 500mg. • The strength was incorrectly written and hence dosage and administration incorrect. 	<ul style="list-style-type: none"> • Both the doctor and pharmacist found to be negligent. 	<ul style="list-style-type: none"> • £250,000 • Pharmacist 25% liable for failure to detect and correct the error • Doctor 75% liable for incorrect strength 	
2006	The 'Dexamethasone' case <i>Horton v Evans and Lloyds Pharmacy Ltd (2006)</i>	<ul style="list-style-type: none"> • A woman prescribed dexamethasone at an incorrect strength of 4mg instead of 0.5mg. • Patient's Medication Record (PMR) indicated she had taken 0.5mg in the past. • Pharmacist dispensed the incorrectly written prescription. • Patient returned home to USA, physician continued to prescribe 	<ul style="list-style-type: none"> • Pharmacist should have questioned the correctness of the prescription against the PMR. • Querying of the dose would have alerted the doctor to the mistake 	<ul style="list-style-type: none"> • £1.5 million apportioned between the doctor and the employer of the pharmacist. 	<ul style="list-style-type: none"> • 'Professional assessment' – Every prescription must be professionally assessed by the pharmacist to determine the suitability for the patient. • This does not simply mean to check guidance but to assess its suitability

		<p>4mg based on label of incorrectly dispensed supply.</p> <ul style="list-style-type: none"> • Patient suffered severely from Cushing's syndrome with loss of business and personal difficulties. 			for the individual patient.
2007	The Lee case <i>R v Lee (2007)</i>	<ul style="list-style-type: none"> • Elizabeth Lee, working as locum pharmacist in Tesco stores pharmacy. • Patient (72 year old female) female prescribed amoxicillin and prednisolone for wheezing inflammation and infection in one lung. • Amoxicillin correctly dispensed, correct label generated for prednisolone but the incorrect product, propranolol selected. The prednisolone label attached to propranolol. • Lee's initials on the box, indicating she had carried out a check. <ul style="list-style-type: none"> • Patient took the medication and collapsed. Later died due to cardiac arrest 	<ul style="list-style-type: none"> • Lee was initially charged with gross negligence manslaughter. • A causal link between patient's death and dispensing error could not be established. • Changed to two charges under section 85(5) and section 64(1) of the Medicines Act 1968. • In Appeal, the convictions under section 85(5) were dropped as judiciary found this was not applicable to locum pharmacists and only applicable to employers and owners of pharmacy. 	<ul style="list-style-type: none"> • Initially sentenced to three months imprisonment suspended for eighteen months and supervision for twelve months for offences under section 85(5). • Had Lee not pleaded guilty to a lesser sentence, the sentence would have been greater. • In appeal, the penalty for charges under 64(1) was set at £300. 	<ul style="list-style-type: none"> • Section 85(5) of the Medicines Act 1968 can only be applied to persons carrying on the business, i.e. employers and companies and not locum pharmacists. • Pharmacists can still be convicted under section 64 of the Medicines Act 1968.

			<ul style="list-style-type: none"> Lee pleaded guilty to charges under section 64(1). 		
2009	The Prestatyn case <i>Mahoney v Prestatyn Magistrates Court (2009)</i>	<ul style="list-style-type: none"> Patient prescribed spironolactone but supplied sertraline instead. Patient suffering from liver disease took medication and following admission to hospital died. The dispenser originally selected the wrong medication. 	<ul style="list-style-type: none"> Both the dispenser and the pharmacist prosecuted under section 64 of the Medicines Act 1968. The dispenser was found to be partially responsible as she was an important link in the supply chain and thus is in a position of some responsibility. The pharmacist's failings did not break the supply chain. 	<ul style="list-style-type: none"> Both prosecuted under section 64. <ul style="list-style-type: none"> Pharmacist: £2065 Dispenser: £270 	<ul style="list-style-type: none"> In the public interest, all individuals supplying medication can be accountable for mistakes. The presence of a pharmacist does not simply remove the dispenser's responsibility

1.10 The Pharmacists' Defence Association

The case of Elizabeth Lee, which became a catalyst for a national effort amongst the pharmacy profession to decriminalise dispensing errors, was defended by the Pharmacists' Defence Association (PDA). The Pharmacists' Defence Association is a not-for-profit organisation which aims to look after the needs of the individual pharmacist in an increasingly hostile environment where employee and locum pharmacists make up most of the profession. Established in 2003 from The Pharmacy Insurance Agency (PIA), the PDA claims to be more than just an indemnity insurance provider as it seeks to advise, support and protect its members in their employment and professional activities. Since employment patterns have undergone considerable change in comparison to what they were when many of the representative pharmacy organisations were established, the PDA recognises itself as the only organisation that looks out for the needs of the individual pharmacist rather than the interests of the employer. As well as providing pharmacists with indemnity insurance cover, the PDA is actively involved in lobbying for the interests of the individual pharmacist and the development of the profession. Currently, the PDA has 26000 registered members of which 12000 work in community pharmacy.

Chapter 2

Literature Review

2.1 Introduction

This chapter will present a review of the relevant literature in the area of dispensing errors in community pharmacy. In order to address the needs of the research question, a comprehensive search was undertaken of a wide selection of electronic literature databases: PubMed, ScienceDirect, Web of Knowledge, Google Scholar and Ovid. The search terms used are listed in Table 4 below. The databases were searched for full text and any studies in other than English language were excluded from the literature review. This review will summarise previous research which has investigated the incidence, types and causes of dispensing errors in community pharmacy. It is important to note that any literature relating to dispensing errors unrelated to the dispensing process, i.e. prescribing errors, administration errors etc., have been excluded from the literature review in order to maintain a focussed discussion of relevant literature in community pharmacy. Gaps in knowledge will also be highlighted, and how the present thesis will address these.

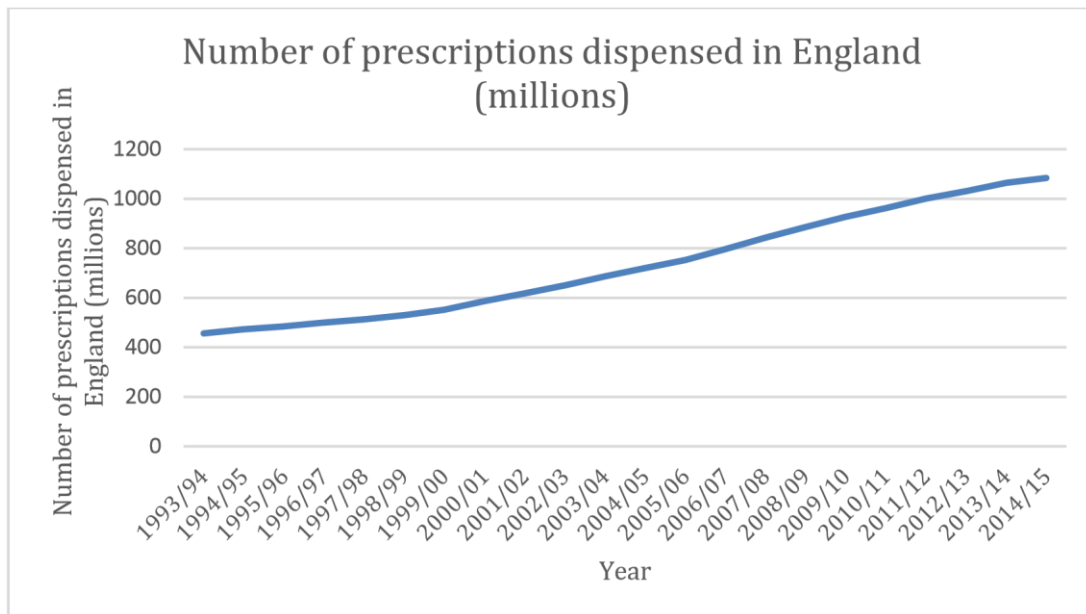
Table 4 Terms used for the literature search

Setting terms	Dispensing errors	Nature of errors
Pharmacy	Dispensing errors	Types
Community pharmacy	Medication errors	Causes
	Pharmacy errors	Contributory factors
	Pharmacist errors	Incidence
	Mistakes	Likelihood
	Patient safety	Predictors
	Medication safety	Workload
	Patient care	Stress
		Pressure
		Job satisfaction
		Interruptions
		Distractions
		Staff
		Packaging
		Sound
		Light

2.2 Volume of dispensing: 1948-present

Prior to the inception of the NHS in 1948, dispensing of prescriptions accounted for less than 10% of the income of registered pharmacies (Anderson, 2015). This soon changed as the establishment of the NHS allowed all medicines prescribed by a doctor to be available free of charge. Within a year, the number of prescriptions dispensed in community pharmacy quadrupled, from 70 million in 1947 to 250 million in 1949 (Anderson, 2015). By the 1960s, as the pharmaceutical industry expanded, so too did the volume of prescriptions presented to community pharmacies, and by now, dispensing of prescriptions accounted for more than half the income of most contractors (Anderson, 2015, Savage, 1999). Over the years, the corollary of the remuneration system, in which high prescription volumes were associated with increased income, led to dispensing occupying a dominant position in the role of a community pharmacist. As such, prescription volumes dispensed by community pharmacies continued to rise throughout the 1970s and 1980s and picked up pace in the 1990s through to the 2000s (Anderson, 2015). Dispensing volume has continued to increase steadily after the contractual changes of 2005 (see Figure 2). In 2014-2015, 1.084 billion prescription items were dispensed in the community in England, which was an increase of almost 2% from 2013-2014 (Health and Social Care Information Centre, 2016b). The number of prescriptions dispensed in the community increased by more than 50% over the decade from 2004-05 to 2014-15 (Health and Social Care Information Centre, 2016b).

Figure 2 The number of prescriptions dispensed in community pharmacy in England 1993/94-2014/15 (Health and Social Care Information Centre, 2016b)

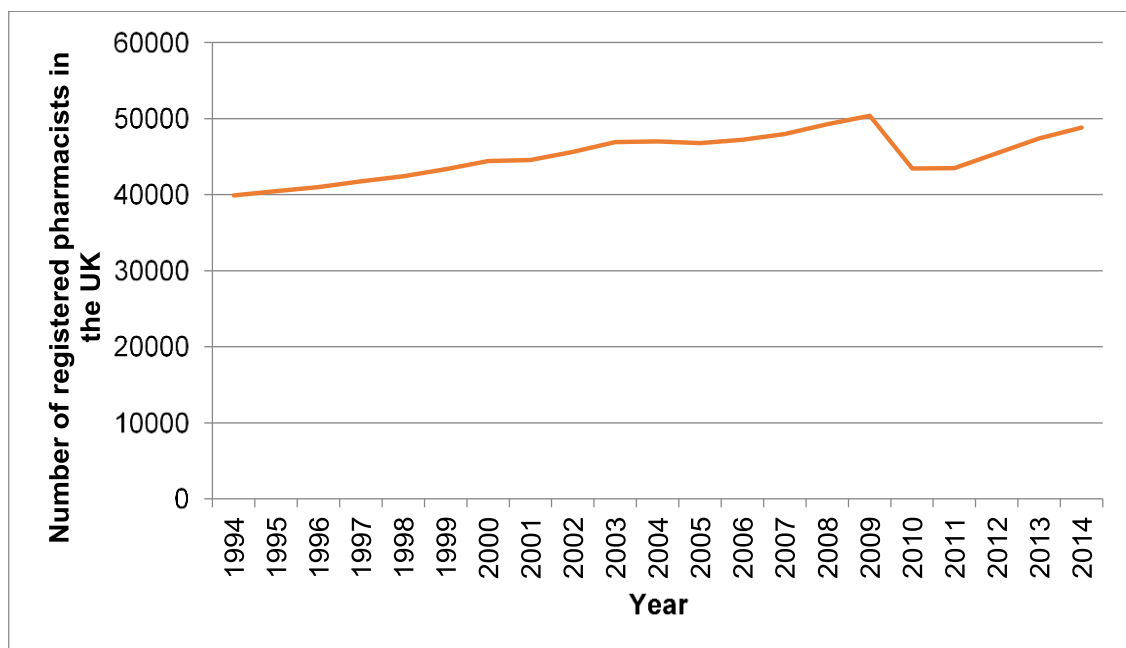


2.3 Incidence of dispensing errors

As mentioned in the previous section, since the late 1940s, an increasing trend has been observed in the number of prescriptions dispensed in community pharmacy. Previous research suggests that a high prescription volume may be implicated in dispensing errors; however a robust measure of the relationship between these variables is limited (James et al., 2011b, James et al., 2009, Peterson et al., 1999). It may be argued that an increase in the number of registered pharmacists, as well as the increase in the number of registered community pharmacies in the past two decades may have helped counterbalance the workload associated with increasing prescription volumes. However, at present, research examining the changes in the rate of dispensing errors since the introduction of the new contractual framework is limited, thus, it is difficult to determine whether the increase in the number of registered pharmacists is sufficient to meet the workload demands associated with the increasing prescription volumes. Furthermore, whilst the number of registered community pharmacies increased by 13.4% between the 2007/08 and 2016/17, the percentage increase in the number of prescriptions dispensed during the same period was considerably higher (39.9%) (Health and Social Care Information Centre, 2017). Given

that pharmacies still operate on a one pharmacist per pharmacy model, the increase in pharmacist numbers would make no difference in meeting workload demands associated with increasing prescription volumes. The graph below shows the trends in the number of pharmacists registered in the UK since 1994 to 2014. The decrease in pharmacist numbers between 2009 and 2010 was largely due to retired pharmacists opting not to register as a 'practising pharmacist' when the GPhC came into being and hence no longer being considered as pharmacists as they were before.

Figure 3 The number of registered pharmacists in the UK (General Pharmaceutical Council, 2015)



The dispensing error rate may be a useful marker of the quality of patient safety within community pharmacy, however, quantification and assessment of this variable is limited (Flynn et al., 1999, Nordén-Hägg et al., 2010). At present, the incidence of dispensing errors, both in the UK and internationally, has largely been researched in secondary care and as such these findings may not be applicable to primary care.

Previous research measuring the incidence of dispensing errors and near-misses in community pharmacy has mainly taken a prospective survey methodology approach. Table 6 shows a summary of previous dispensing errors research studies. The table shows seven previous research studies have attempted to measure the rate of dispensing errors in community pharmacy. Of these, five used a self-reported survey

instrument as the method to collect data (Ashcroft et al., 2005, Chua et al., 2003, Knudsen et al., 2007a, Lynskey et al., 2007, Sánchez, 2013), whilst two studies, one US and one UK study, used a direct un-disguised (where respondents are aware they are being observed) observation approach (Flynn et al., 2002, Franklin and O'Grady, 2007).

There have been four studies, all adopting a prospective approach, conducted in the UK to measure the incidence of dispensing errors in community pharmacy (Ashcroft et al., 2005, Chua et al., 2003, Franklin and O'Grady, 2007, Lynskey et al., 2007). The largest of these is the study conducted by Ashcroft et al. (2005). The study involved data collection over a period of five weeks from thirty five community pharmacies (9 independent pharmacies and 26 chain pharmacies). Over the study period, a total of 125,395 prescription items were dispensed of which 50 were classified as a dispensing error and 280 were classified as a near-miss, suggesting a mean error rate of 4 dispensing errors and 22 near misses per 10,000 prescription items dispensed (0.04% and 0.22% respectively). Another smaller scale prospective study conducted by Chua et al. (2003) collected data from four community pharmacies over a total period of eight weeks. A total of 51,357 prescriptions items were dispensed during the study period, of which 39 were dispensing errors and 247 were near-misses resulting in a mean error rate of 0.08% for dispensing errors and 0.48% for near-misses. Lynskey et al. (2007) also conducted a prospective study using a self-reporting instrument. Data were collected from 15 community pharmacies over a period of eight weeks. A total of 145 incidents took place throughout the study period, of which 113 (78%) were near-misses and 32 (22%) were dispensing errors. Unlike the previously mentioned studies, Lynskey et al. (2007) reported the data relating to the incidents themselves, therefore an incidence of dispensing errors cannot be deduced from their study. Of the UK studies, only one has adopted an observational method as opposed to self-reporting. Franklin and O'Grady (2007) conducted an observational study of 11 community pharmacies over a period of six months, by examining dispensed prescriptions for errors. A dispensing error rate of 3.0% was observed, which is appreciably higher than the rates mentioned in the previous studies. The clinical

significance of these errors was also assessed: 67% were minor errors, 32% moderate and 1% were errors considered to be severe.

The incidence of dispensing errors in community pharmacy has also been studied outside the UK. A Spanish study conducted by Sánchez (2013) collected data using a self-reporting approach from a community pharmacy in Madrid over a period of 13 months. The results revealed that of the 42,000 prescription items dispensed at the pharmacy, 216 were dispensing errors and 774 were near-misses, yielding an error rate of 0.51% and 1.84% respectively. Furthermore, a Danish study carried out by Knudsen et al. (2007a) also attempted to measure the incidence of dispensing errors from forty community pharmacies. Data were collected retrospectively about dispensing errors that had already taken place in addition to data collected prospectively about adverse events caused as a result of dispensing errors. An error rate was calculated using the retrospective data; 0.01% for dispensing errors and 0.02% for near-misses. However, possibly the most robust study measuring the incidence of dispensing errors in community is that of Flynn et al. (2002) conducted in the US. A direct un-disguised approach was taken to observe prescriptions being dispensed or after they were dispensed in 50 community pharmacies. The study reported a dispensing error rate of 1.57% and near-miss rate of 1.28%, which is appreciably higher than the previous studies mentioned.

Previous research also suggests that community pharmacists perceive the rates of dispensing errors in community pharmacy to be increasing. A cross-sectional survey conducted in Australia revealed that 82% of community pharmacists believed that the risk of dispensing errors is increasing (Peterson et al., 1999). Bond and Raehl (2001) also carried out a cross-sectional survey of 2,437 US community pharmacists. The results showed that 34% of pharmacists believed that one patient per week was at a risk of receiving a dispensing error in comparison to 23% who believed there was no risk to patients for dispensing errors.

There is a considerable variation in the measure of incidence of dispensing errors in community pharmacy in the abovementioned literature as can be seen in the Table 5 below.

Table 5 Summary of incidence rates of dispensing errors from previous studies

Self-reported prospective study			Observational study			Retrospective		
Author	Dispensing error rate	Near-miss rate	Author	Dispensing error rate	Near-miss rate	Author	Dispensing error rate	Near-miss rate
Ashcroft et al. (2005)	0.04%	0.22%	Franklin and O'Grady (2007)	3%		Knudsen et al. (2007a)	0.01%	0.02%
Chua et al. (2003)	0.08%	0.48%	Flynn et al. (1999)	1.57%	1.28%			
Sánchez (2013)	0.51%	1.84%						

The rates of error occurrence of the self-reported prospective research studies are considerably lower than the findings of observational studies. Furthermore, the results of the self-reported studies mentioned above revealed that near-misses occur at around a four to six times greater rate than dispensing incidents. It should be noted that the self-reporting method of data collection adopted by all three studies is likely to underestimate the true frequency of dispensing errors due to two reasons: 'social-desirability response bias' whereby respondents' under-report errors in order to behave in a manner considered favourable by others; and, 'recall bias' where the person making the error may not be aware or is unable to remember that an error has been made (Kiekkas et al., 2009). Furthermore, a higher near-miss rate in comparison to dispensing error rate suggests that quality control during the dispensing process has a key role in preventing dispensing errors.

The incidence of dispensing errors reported by observational methods are appreciably higher than those of the self-reported studies and the ratio of dispensing errors to the near-misses also do not correlate with the self-reported prospective studies either. The higher error rates may be attributable to the observational method of data collection, in which the error is identified and rectified by the observer before the medication is supplied to the patient. As such, errors which may have been identified in the patient counselling stage are classified as dispensing errors. Furthermore, observational method of data collection may be confounded with a bias caused by the 'Hawthorne effect', which refers to the tendency of individuals to change their behaviour due to the awareness of being observed (James et al., 2009). Additionally, variances in work processes and legal structures of pharmacy regulation between different jurisdictions means that results of the UK and US studies may not be directly comparable.

Table 6 Summary of previous dispensing error research studies

Author(s) (year)	Country	Methods	Key findings		
			Incidence	Types	Causes/contributory factors
Al-Arifi (2014)	Saudi Arabia	Cross-sectional survey n=656 pharmacists			Pharmacist assistant 82.2% Workload 72.5%
Ashcroft et al. (2005)	UK	Prospective study n=125395 items dispensed	4 dispensing errors per 10000 items dispensed (0.04%) 22 near-misses per 10000 items dispensed (0.22%)	Selection errors 60.3% Labelling errors 33.0% Bagging errors 6.6%	Misreading Rx 24.5% Similar drug names 16.8% Selection of previous drug/dose from PMR Similar packaging 7.6%
Bond and Raehl (2001)	US	Survey n=2437 pharmacists	23% reported no risk to px for dispensing errors 34% reported one px/week at risk of receiving a dispensing error		Risk of dispensing errors increased as Rx dispensed/hour increased ($r_s=0.285$, $p<0.001$)
Chua et al. (2003)	UK	Prospective data collection form (n=51357 items dispensed) followed by focus group	39 dispensing errors (0.08%) 247 near-misses (0.48%)	Incorrect strength 23.1% Incorrect drug 19.2% Incorrect quantity 17.5% Incorrect dosage form 16.4% Incorrect label 15.17%	

Pervanas et al. (2016)	US	Retrospective analysis of medication error reports (n=68 medication errors)		Incorrect medication 40% Incorrect dose 31% Incorrect directions 12%	68% errors when one pharmacist on duty 29% errors when two pharmacists on duty 3% pharmacists when 3 pharmacists on duty
Franklin and O'Grady (2007)	UK	Observational prospective study collecting data from 11 pharmacies (n=2859 items dispensed)	Dispensing error rate 3.0% (n=95/2859) Of these: 67% minor errors 32% moderate errors 1% severe errors	Content error in 1.7% of total items dispensed Labelling error in 1.6% of total items dispensed	
Lynskey et al. (2007)	UK	Prospective study collecting data from 15 pharmacies (n=145 incidents)	78 % of incidents near-misses (n=113/145) 22% of incidents dispensing errors (n=32/145)	Selection errors 45% (n=51/145) Labelling errors 34% (n=38/145)	No cause identified in 30% of near-misses and 41% dispensing errors Similar drug names in 19% of near-misses and 9.4% of dispensing errors
Peterson et al. (1999)	Australia	Survey (n=209 pharmacists)	82% (n=171/209) pharmacists believed that the risk of dispensing errors is increasing		High prescription volume Pharmacist fatigue Pharmacist overwork Interruptions Similar/confusing drug names
Teinilä et al. (2008)	Finland	Survey (n=340 pharmacists)			Heavy workload 24% of all causes identified Illegible/handwritten Rx 15% of all causes identified Carelessness of individual 10% of all causes identified Similar drug packaging 7% of all causes identified
Sánchez (2013)	Spain	Prospective study (n=42000 prescription items dispensed)	216 dispensing errors (0.51%) 774 near-misses (1.84%)	Wrong drug dispensed Drug duplication Wrong dosage	Prescription based errors such as illegible prescription

Knudsen et al. (2007a)	Denmark	Prospective study + Retrospective analysis (n=365 pooled incidents)	Dispensing errors 0.01% of items dispensed Near-misses 0.02% of items dispensed	Most frequent transcription errors: Wrong strength Wrong medicine Wrong dosage	
Flynn et al. (2002)	US	Direct undisguised observation study (n=5784 prescriptions inspected)	Dispensing errors accounted 1.57% of prescriptions inspected (n=91/5784) Near-misses accounted for 1.28% of prescriptions inspected (n=74/5784)	41.7% content errors 58.4% labelling errors Incorrect label instructions 44% Incorrect quantity 14% Incorrect label information 14% Incorrect drug 9% Incorrect strength 9%	Lighting levels, type of inspection system, staffing levels and arrangement of drug stock were associated with errors

2.4 Taxonomy of dispensing errors

At present, there is no taxonomy of dispensing errors (James et al., 2009). This poses a great difficulty in categorising errors as there is no universally accepted or validated method for classifying dispensing errors and, as such, this lack of uniformity is a barrier in the efficient analysis of the presently available research material.

Researchers have used numerous methods of characterising medication errors. According to Cheung et al. (2009), errors can be classified according to the stage at which the error occurs in the patient care pathway. These range from errors that take place at the prescribing stage through to dispensing and administration. However, it must be acknowledged that although, there has been an increasing focus on the occurrence of dispensing errors in the pharmacy setting in recent years, most of the presently available literature concerns prescribing errors (Mangino, 2004). This may be appropriate as one study suggests that the likelihood of an error occurring is most frequent at the prescribing stage of the patient care pathway (Knudsen et al., 2007a).

As previously mentioned, errors can arise at any stage of the pharmaceutical care pathway, from the prescribing of the medication through to the administration stage. Due to the fact that the process of dispensing medication falls into the latter part of the medication pathway, it presents an opportunity to identify and correct errors that originated during the prescribing process. The corollary of this is that a failure by a pharmacist to detect a prescribing error would be categorised as a dispensing error (Cheung et al., 2009). This would also be the case in the event of a failure to detect a manufacturing error or if the counselling provided to the patient regarding the use of the medication was inadequate (Cheung et al., 2009).

Another method of classifying dispensing errors that has been used by various researchers is to categorise according to the stage of the overall dispensing process in which the error took place. Beso et al. (2005) identified these as two major categories namely label errors and content errors whilst Knudsen et al. (2007a)

suggests the use of prescribing, transcription and dispensing errors, where transcription is the intermediate stage that involves the transfer of data from the prescription to the label. Results from this Danish study found that, of the errors that take place within the community pharmacy setting, transcription errors were most frequent however variations in practice between the UK and Denmark means that these results may not be applicable to the UK (Knudsen et al., 2007a).

James et al. (2011a) however, classified errors according to whether the error was identified within the pharmacy (prevented dispensing incident) or after the medication had left the pharmacy (unprevented dispensing incident); an approach also adopted by the NPSA. According to a comprehensive literature review of international dispensing error research, the rate of prevented dispensing incidents and unprevented dispensing incidents in the UK ranged from 0.22-0.48% and 0.04-3.32% respectively (James et al., 2009). Supply of the wrong drug, strength, form, quantity and labels with incorrect directions constituted the most common type of both prevented and unprevented dispensing incidents (James et al., 2011b). Franklin and O'Grady (2007) grouped errors into two categories, labelling errors and content errors. Each error was also assigned a degree of clinical significance which was determined by a panel of judges. Excluding the wrong quantity as a content error, Franklin and O'Grady (2007) found that a wrong content error occurred in 0.7% of all dispensed items and the majority of these errors were considered to be of moderate clinical significance. However wrong content errors that included the wrong quantity as a content error occurred in 1.7% of all dispensed items and the majority of these were considered to be of minor clinical significance.

2.5 Aetiology of dispensing errors

Dispensing is a process that carries an inherent risk of errors as the incorrect supply and administration of pharmaceutical products which are potent and powerful in nature, can be harmful or fatal to patients (Langley, 2013). Over the last decade, policy documents such as the NPSA's 'Seven steps to patient safety for primary care', as well studies examining the causes of errors in healthcare, reflect a growing interest in

understanding human error using psychological and human-factors perspectives in an attempt to minimise human error in healthcare (Carayon et al., 2014, Drews, 2016, National Patient Safety Agency, 2004, Phipps et al., 2009, Szeinbach et al., 2007). Before discussing the causes of dispensing errors, the theoretical basis of human error and the application of human factors and ergonomics as an approach to identifying and minimising dispensing errors will be discussed.

2.5.1 Human Factors and Ergonomics

Human Factors and Ergonomics (HFE) is a scientific discipline concerned with the understanding of the interactions among humans and other elements of the work system (Carayon, 2016). HFE is considered to have emerged during the Second World War in response to advances in technology. Concerns were raised that due to the complexities of new technologies, human limitations may prevent use of new technologies to full potential (Carayon, 2016). Prior to the Second World War, focus was placed on 'fitting the human to the work'. However, the emergence of HFE shifted this concept towards designing systems that 'fit the work to the human' (Carayon, 2016). Thus a key purpose of HFE is to design systems that suit the needs, abilities and limitations of individuals (Carayon, 2016). The nuclear and aviation industries are safety critical industries that have successfully applied HFE to engineer reliable systems for minimising human error; for example, in the USA, the statistical chance of dying when travelling by scheduled flight is less than 1 in 3 million (Leape, 2006). However application of HFE in designing and maintaining the safety systems in healthcare has seen slow progress (Hignett et al., 2013). The Institute of Medicine's (IOM) report 'To Err is Human' published in 2000 initiated a renewed interest in the application of HFE to improve patient safety within healthcare (Sheridan, 2003). A HFE approach to designing work systems was reflected in the NPSA's 'Design for patient safety: A guide to the design of the dispensary environment' (National Patient Safety Agency, 2007). However, the NHS remains one the few safety critical organisations that does not have a specialist human factors group in the form committees and courses which can overlook and guide the application of HFE as an attempt to improve patient safety (Flin et al., 2013).

2.5.2 Human Error

Over the last two decades, as the focus on the study of error, in particular in safety critical domains, such as the aviation and nuclear industries grew, so too did the number of proposed definitions of error. Reason's definition of human error however, is one that is widely cited, which defines an error as 'a generic term to encompass all those occasions in which a planned sequence of mental or physical activities fails to achieve its intended outcome, and when these failures cannot be attributed to the intervention of some chance agency (Reason, 2000). Other definitions vary around that of Leape (2006), which describes an error as 'an unintended act or as an act that does not achieve its intended outcome'. However, a clear, comprehensive and universally accepted definition of human error does not yet exist.

The human failure component is apparent in almost all major safety incidents. According to Feyer and Williamson (1998), almost 90% of workplace accidents are estimated to have human failure as a cause, thus reinforcing the inevitability of the occurrence of human error. Although the likelihood of human error occurring can never be completely eliminated, it can be reduced by improving systems through, for example, improvements in training, reductions in workload and the alleviation of stress (Reason, 2000, Wiegmann and Shappell, 2001). Leading error experts have proposed models of error to provide a theoretical basis of the nature of errors in attempt to aid the understanding of the fundamental factors and mechanisms at play when an error takes place. Reason's model of human error is one that has gained widespread recognition within healthcare organisations and has previously been applied to investigate prescribing errors (Dean et al., 2002).

2.5.2.1 Reason's Model of Human Error

Reason (2000) proposes two approaches to understanding human error; the person approach and the system approach. Each will be discussed in detail below.

2.5.2.1.1 The Person approach

The person approach places a focus on individual factors and assumes the individual as responsible for the error. The unsafe acts that produce errors are considered failures in the mental processes of the individual which results in inattention, forgetfulness and moral weakness. Based on Rasmussen (1983)'s model of human performance, Reason (1990) categorises the errors made by individuals into three types:

Skill-based errors – The action made is not what was intended. These are also referred to 'slips' and 'lapses'.

Rule-based errors or 'mistakes' – The intended action is made but does not achieve its intended outcome due to incorrect application of the rule.

Knowledge-based errors or 'mistakes' – The intended action is made but does not achieve its outcome because the individual is faced with a situation beyond their knowledge or skills thus resulting in a misinterpretation of the problem.

Reason (1990) further argues that 'slips' and 'mistakes' originate from two different levels of mental functioning; automatic and problem-solving. Errors that occur in the automatic mode are 'slips' which result from a failure to pay attention at a critical moment (Leape, 2006, Reason, 1990). Factors such as fatigue, noise, heat, anxiety, anger, workload, stress and illness can all contribute to impaired physiological and psychological performance (Mangino, 2004), which in turn can divert attention from the task at hand and increase the likelihood of slips (Leape, 2006, Reason, 1990). Errors made in the problem-solving mode however, involve more complex cognitive processes and are called 'mistakes'. These are inadvertent errors where an incorrect decision is made, although at the time, the individual believes it to be correct (Leape, 2006, Reason, 1990).

Reason (1990) suggests that the dominance of the person approach within medicine and healthcare may arise from the emotional satisfaction and ease of blaming individuals rather than identifying weaknesses in systems.

2.5.2.1.2 The system approach

In contrast to the person approach, the system approach is based on the premise that humans are fallible. Reason (1990) states 'we cannot change the human condition, but we can change the conditions under which humans work' in order to place a focus on the working conditions of individuals and advocate the design of defences in systems, which prevent humans from making an error or at least mitigate its effects. Human performance is very much dependent on a complex array of interactions with stimuli that, by and large, originate from its surrounding environment. Therefore, it is essential to recognise that 'there is an inseparable tie between individuals, their tools and machines and their general work environment' (Heinrich, Petersen and Roos, 1980 as cited by Wiegmann and Shappell (2001)). An analysis of human interaction at the human-human interface, human-machine interface and human-environment/organisation interface is therefore a fundamental step in the identification of error-producing circumstances and making changes at these interfaces (Wiegmann and Shappell, 2001). Errors arising at these interfaces can be approached through a means of sociotechnical analysis.

Reason's Swiss cheese model is perhaps the most influential human factors paradigm for analysing human error, particularly in medical error and patient safety domains (Reason, 2000). It illustrates that in any system, there are hierarchical levels of defence represented by the layers of the Swiss cheese e.g. the final accuracy check in the dispensing process (Reason, 2000). Each level of defence, due to poor system design, contains holes which represent defects of the system (Reason, 2000). The holes in each slice may be a result of either latent conditions or active failure. Active failures have an immediate adverse effect and are unsafe acts that are committed including slips, lapses and mistakes (Leape, 1997, Reason, 2000).

Figure 4 The Swiss Cheese Model of system failure (Anon, 2017)



Latent conditions are defects in the system whose effects are delayed (Leape, 1997, Reason, 2000). The presence of latent conditions means that the occurrence of errors is inevitable in the system; awaiting to occur as soon as there is an unforeseen alignment of the holes across all defence levels (Reason, 2000). Latent conditions refer to organisational and managerial influences that can precipitate human error for example, poor design of work environment and equipment, ineffective training, inadequate supervision, ineffective communications, inadequate resources such as low staffing levels and uncertainties in roles and responsibilities. Reason's Swiss cheese model of accident causation has been used to analyse the causes of error in hospital pharmacy (Beso et al., 2005). However, to date, it does not appear to have been applied to error management within community pharmacy.

2.5.3 Sociotechnical Model

Sociotechnical factors form a subset of the wider domain of HFE (Carayon, 2016). Sociotechnical factors refer to the relationship between the technical, psychological and social elements of a work system (Phipps et al., 2009). Previous research suggests that an analysis of the community pharmacy work processes in a sociotechnical context may provide a useful starting point in addressing patient safety

issues by engineering the causes of error out of the system (Phipps et al., 2009, Szeinbach et al., 2007). Specific consideration of the causes of dispensing errors in community pharmacy from a sociotechnical perspective will now be discussed.

2.5.3.1 Technical Factors

Increased workload, staffing, interruptions, types of dispensing systems and software, pharmacy design and light and sound conditions have all been cited as factors influencing the occurrence of dispensing errors (Buchanan et al., 1991, Flynn et al., 1999, Hassell et al., 2011, Peterson et al., 1999, Phipps et al., 2009).

2.5.3.1.1 Workload

Workload within community pharmacy has been a topic of considerable interest, particularly after the introduction of the pharmaceutical contract of 2005 (Gidman, 2011, Gidman et al., 2007). In recent years a considerable increase in workload within the UK has been observed (Gidman et al., 2007). It is thought that this may be due to two reasons; first, the demand for pharmaceutical services has increased, and second, the role for pharmacists has expanded (Gidman et al., 2007). Findings of a comprehensive review of international literature on dispensing errors found that the most commonly cited cause of dispensing errors was high workload (James et al., 2009). However, at present what constitutes high workload is ill-defined, and there appears to be an inconsistency in the measures of workload used in the literature (Holden et al., 2010).

Most often in pharmacy practice research, an objective measure of workload such as a volume – for example, the number of prescriptions dispensed – or intensity – for example, the number of prescriptions dispensed per unit of time – is operationalised (Chui et al., 2014, Holden et al., 2010, Reilley et al., 2002). However, from a human factors perspective, workload is a multifaceted construct which cannot be simplified to merely volume or intensity of work as it neglects the subjective experience of workload (Chui et al., 2014, Holden et al., 2010). New conceptualisations and measures of workload have been used in the nursing and medical disciplines to better understand

the characteristics and effects of workload (Chui et al., 2014, Holden et al., 2010). Dispensing a prescription is a complex series of psychomotor steps (the motor effects of mental processes e.g. label generation, product selection) and perceptual judgements involving decision making (e.g. being able to make a correct interpretation of a prescription, ensuring the accuracy of products selected) (Reilley et al., 2002). Therefore, conceptualisation of pharmacist workload would require an appreciation of both the physical and mental demands of the dispensing process. A human factors approach to understanding pharmacist workload would be to characterise the multi-dimensional nature of workload – this would constitute both objective and subjective (mental) measures of workload (Holden et al., 2010). This literature review will present a summary of previous research examining objective and subjective measures of workload in pharmacy.

2.5.3.1.1 Objective measures of workload

The volume, intensity and the types of activities undertaken can be considered objective measures of workload. At present most literature surrounding workload in community pharmacy has utilised objective measures of workload. Previous research suggests that high-prescription volume correlates positively with the rate of dispensing errors (Bond and Raehl, 2001, Eden et al., 2009, Gidman, 2011, Hassell et al., 2011, Lea et al., 2012, Schafheutle et al., 2011, Szeinbach et al., 2007). Similarly, Ashcroft et al. (2005) found that errors were most likely to occur when the pharmacy was busier than normal. The results from an Australian study, where pharmacists' attitudes towards dispensing errors were assessed through postal surveys, suggests that pharmacists believed high prescription volume, pharmacist fatigue and high workload are the major contributory factors to dispensing errors (Peterson et al., 1999). Respondents to this survey were also asked to suggest what they considered to be a safe dispensing load. The results suggest that on average 150 prescription items per nine hour working day, or 17 items per hour, can be considered a safe dispensing load for, or in the presence of, a single pharmacist. In contrast, research conducted by Grasha (2001) found that the rate of errors was greater in both the low and high-prescription volume pharmacies which suggests that the relationship between these variables may be difficult to characterise (Grasha, 2001). Therefore, merely taking

prescription volume as a parameter to assess workload is not a useful approach in determining total workload (Buchanan et al., 1991, Chui et al., 2014, Holden et al., 2010). This is because the increasing provision of clinical services, for which there is relatively little remuneration, may be contributing further to a pharmacist's total work burden. A further consideration must be given to the fact that the nature of the pharmacy profession is that it is demand driven; patients can present to the pharmacy with a prescription at any time during the functioning hours of the pharmacy, as opposed to appointment based systems in general practice and other healthcare professions (Ashcroft et al., 2005). This means that there can be periods of unpredictable high work activity demanding high performance within a relatively short period of time. Such fluctuations in workload create an imbalance in the performance requirements of a pharmacist which means that effective management of workload is not always possible and this can increase the likelihood of a pharmacist making dispensing errors. High dispensing workloads and organisational pressures to meet targets of delivering more clinical and pharmaceutical services may also be a cause of increasing levels of stress and reduced job satisfaction amongst community pharmacists (Hassell et al., 2011).

Another aspect of objective workload is the types of activities undertaken. Gaining an insight into the amount of time spent on various activities by community pharmacists can be considered a viable approach in identifying ways in which workload can be better managed in community pharmacy. However, at present this is an under-researched area as there is limited evidence relating to the amount of time spent on various activities by a community pharmacist. Furthermore, any research that does exist dates back to the pre-contractual changes of 2005, which undermines the application of prior research findings to today's community pharmacy. Within the UK, with the expansion of pharmacist's roles after the contractual changes, one would expect some changes in the types of activities carried out by pharmacists. At present there is a single study published post 2005 by Davies et al. (2014) that explores the types of activities undertaken by community pharmacists. The findings suggest that, despite efforts to bring about a change in the role of the community pharmacists away

from high-volume dispensing and towards the provision of clinical services, the types of activities that constitute a pharmacist's workload have remained fairly constant.

2.5.3.1.1.2 Subjective measure of workload

Subjective, or mental, measures of workload go beyond quantification of tasks or activities and attempt to measure the mental demands, or perceptions of workload for a task for example, perceptions of busyness (Chui et al., 2014, Holden et al., 2010). Understanding the effects of mental workload on workers has been an essential component in improving and maintaining the safety of high-risk industries, for example, the aviation industry and radiology where workers are required to maintain performance in multiple interdependent tasks, often under high pressure conditions (Reilley et al., 2002). Similarly, the dispensing process which involves several sequential, repetitive and interdependent operations also carries the risk of potentially serious consequences in the event of an error (Grasha and Schell, 2001). However, at present there is very little research examining mental workload in community pharmacy and how it impacts the occurrence of dispensing errors and pharmacists' wellbeing. Any research that does exist originates predominantly from the US, with very little evidence from the UK. Since subjective workload is a perceptive measure of workload, it cannot be measured directly.

Studies looking at the impact of subjective workload on perceived performance during the dispensing process suggest that the workload-error relationship is complex (Chui et al., 2014, Grasha and Schell, 2001, Holden et al., 2010, Reilley et al., 2002). For example, Holden et al. (2010) conducted a cross-sectional survey of US hospital pharmacists, where the perceived mental workload of pharmacists was measured using a self-reported form adapted from the National Aeronautics and Space Administration Task Load Index (NASA-TLX) and the Subjective Workload Assessment Technique (SWAT). The NASA-TLX and SWAT are the two most psychometrically valid and reliable measures of subjective mental workload (Holden et al., 2010). The perceived mental demands of a task were divided into two types; external demands e.g. interruptions, divided attention and internal demands e.g. concentration and mental effort. Their results showed the external demands were

significantly associated with perceptions of increased error likelihood, whereas internal demands were not associated with increased error likelihood. Similarly, Chui et al. (2014) also adopted a survey methodology to investigate the multiple levels of subjective workload demands during the dispensing process amongst community pharmacists. The results suggest that task performance is influenced by workload perceptions at various levels; the organisational level (e.g. adequacy of support staff), the job level (e.g. volume of work) and at the task level (mental demands associated with the task) (Chui et al., 2014). A high volume of work or work activity relating to time pressures was associated with higher levels of subjective workload (Chui et al., 2014). In keeping with the findings of Holden et al. (2010), external task demands were associated with higher levels of subjective workload. However, contrary to the findings of Holden et al. (2010), internal task demands which require concentration and mental attention displayed a positive relationship with levels of subjective workload (Chui et al., 2014). The findings of Chui et al. (2014), Chui and Mott (2012) and Holden et al. (2010) complement the findings of earlier pharmacy simulation studies by Grasha and Schell (2001) and Reilley et al. (2002) which explored the impacts of subjective workload on dispensing accuracy. The findings of these studies suggest that not all aspects of subjective workload are unwanted e.g. internal task demands, alluding to the idea that workload-error relationship is a complex one. Efficient strategies to reduce error associated with workload should look beyond simplistic model of workload volumes and error occurrence, and look into overcoming external task demands.

2.5.3.1.2 Interruptions and Distractions

Interruptions and distractions commonly disrupt the work activity of pharmacists and compromise the attention that a pharmacist pays to a given task. Previous research suggests a positive association between interruptions and disruptions and dispensing errors (Beso et al., 2005, Chui et al., 2014, Chui and Mott, 2012, Emmerton and Rizk, 2012, Flynn et al., 1999, Grundgeiger and Sanderson, 2009, Holden et al., 2010, James et al., 2009, Knudsen et al., 2007b, Lea et al., 2015). It is thought that interruptions interfere with human cognitive processes that are linked to memory and decision-making (Emmerton and Rizk, 2012, Lea et al., 2015). However at present

there is a lack of evidence to confirm a causal relationship between interruptions and dispensing errors (Grundgeiger and Sanderson, 2009). The incidence of distractions and interruptions is thought to have increased in UK community pharmacy noticeably after the introduction of the community pharmacy contractual changes of 2005 (Lea et al., 2015). Given the absence of evidence relating to the quantitative estimates of interruptions in community pharmacy prior to the contractual changes, it is assumed that an apparent increase in interruptions after the contractual changes may be associated with increasing workloads and role expansion, whereby pharmacists are performing a wider range of tasks.

Possibly the most widely cited study examining interruptions during the dispensing process is that of Flynn et al. (1999) where fourteen pharmacists were videotaped as they dispensed prescriptions in the presence of an observer who checked the dispensed prescriptions to identify any errors. The results revealed that distractions occur at a rate of 8 per hour, and interruptions occur at a rate of 6 per hour. The study also found that there was no significant direct effect of interruptions and distractions in individual prescriptions. However, when the total number of interruptions over half an hour increased, a significant effect on the occurrence of errors was observed (Flynn et al., 1999). A possible explanation for this may be that the diversion of attention as a result of the interruption or distraction created a short break from the work, which resulted in the pharmacist to review their work upon returning to the task. Continued interruptions over half an hour, however, deteriorated the accuracy of pharmacist dispensing, by reducing the pharmacist's attention. These findings concur with other research which suggests that interruptions do not always have a negative effect on error occurrence and medication safety. Whilst interruptions can have a negative impact on pharmacists by creating a disruptive effect on human cognitive processes (thereby increasing mental workload), interruptions can also reduce error occurrence by allowing detection of errors upon resuming to the task after the interruptions (Chui et al., 2014, Flynn et al., 1999, Grundgeiger and Sanderson, 2009).

A more recent study conducted in the UK by Lea et al. (2015) took a qualitative approach to explore interruptions, task-switching and distractions in community

pharmacy. An ethnographic approach was employed to gather almost 124 hours of non-participant observational recordings from eleven different pharmacies. Analysis of observations revealed a prevalence of interruptions, multi-tasking and disruptions throughout the pharmacists' work; most often caused by pharmacy support staff. A possible explanation for this may be a misalignment of support staff training with increasing demands from a wider range of services being provided. The study also sheds light on pharmacists' response to frequent interruptions; pharmacists' continued to permit interruptions during their work. This is in agreement with previous research which suggests a deep-rooted 'culture of interruptions' prevalent in pharmacy as well as other healthcare professions (Grundgeiger and Sanderson, 2009, Knudsen et al., 2007b). Knudsen et al. (2007b) highlights that high interruption/distraction workload can increase the chances of dispensing errors and that this can be reduced by overcoming the 'culture of interruptions' that exists in pharmacy. Analogous to flight regimes experienced by pilots, the dispensing process demands concentration due to high task and mental demands (Duffy, 2010). The 'sterile cockpit rule' is a mechanism that mandates pilots to refrain from engaging in non-flight related conversation and activities during all operations below 10000 feet (Duffy, 2010). Adopting the sterile cockpit rule during the dispensing process can considerably reduce the frequency of interruptions and therefore reduce medication error and patient harm whilst increasing the efficiency of medication delivery (Duffy, 2010).

Negative effects of interruptions are thought to occur due to an increased cognitive workload as a result of task disruptions and interruptions (Chui et al., 2014, Chui and Mott, 2012, Flynn et al., 1999, Grundgeiger and Sanderson, 2009, Holden et al., 2010). Studies investigating the impact of subjective workload on error occurrence indicated that external task demands (e.g. interruptions, divided attention and being rushed) were associated with an increased perceived likelihood of error occurrence (Chui et al., 2014, Chui and Mott, 2012, Holden et al., 2010). On the contrary, Holden et al. (2010) found that internal task demands that require higher levels of concentration and mental effort were not associated with an increased perceived likelihood of error occurrence. These findings suggest that gaining an understanding of the impact of interruptions on human cognition and mental effort are a key step in

identifying effective strategies to overcome errors that are associated with interruptions, multi-tasking and disruptions.

2.5.3.1.3 Look-alike sound-alike drug names and packaging

Orthographic (look-alike) and phonetic (sound-alike) similarities in drug names and/or similarities in packaging of medicines have been cited as a major contributory factor to dispensing errors (Ashcroft et al., 2005, Hellier et al., 2006, James et al., 2009, Lambert et al., 2005, Schell, 2009). Around one in four medication errors is said to involve look-alike sound-alike (LASA) drug names and/or similarities in packaging (Emmerton and Rizk, 2012). A prospective study examining the occurrence of dispensing errors in thirty five community pharmacies found that drug selection errors accounted for 60% of all dispensing errors (Ashcroft et al., 2005). The study also found that almost 17% of all dispensing errors were attributed to similar drug names and almost 8% attributed to similarities in packaging (Ashcroft et al., 2005). Given the significance of LASA drug names and similar packaging on the occurrence of dispensing errors, strategies to reduce errors associated with LASA drug names and packaging could prove to be an effective approach in reducing the occurrence of dispensing errors. However, at present there is limited research within this domain.

It is thought that the presence of similar looking or similar sounding drug names within a visual field distorts the cognitive processes involved in selecting the correct product, thereby increasing the chances of a drug selection error (Irwin et al., 2013). With so many LASA medicines in pharmacies, drug names can often be misidentified as a result of misreading the drug name (Emmerton and Rizk, 2012). LASA drug names are frequently found within a neighbourhood of LASA drug names, often on pharmacy shelves or in lists in dispensing software (Emmerton and Rizk, 2012). When this neighbourhood is dense (when there are a greater number of competing similar names), the presence of other LASA drug names interferes in the identification and selection of the correct drug name (Emmerton and Rizk, 2012). Similarities in packaging, hand-written prescriptions, inadequate lighting and interruptions further confound the correct identification of LASA drug names (Emmerton and Rizk, 2012).

In the past, a number of approaches have been considered to mitigate the error associated with LASA drug names including the use of colour and textual enhancements, such as Tallman lettering (Darker et al., 2011, DeHenau et al., 2016, Emmerton and Rizk, 2012, Filik et al., 2004, Filik et al., 2006, Or and Wang, 2013, Schell, 2009). Tallman lettering is an ergonomic error prevention strategy, endorsed by the World Health Organisation, where upper case letters are used to highlight distinctive parts of confusing names e.g. DOBUTamine and DOPamine instead of dobutamine and dopamine (DeHenau et al., 2016, Filik et al., 2004). However, at present empirical evidence relating to the usefulness of Tallman lettering is contradictory.

Filik et al. (2006) conducted a series of experiments to evaluate the use of Tallman lettering and/or colour as a means of avoiding errors associated with LASA drug names. Their results suggest that whilst Tallman lettering is an effective intervention in reducing errors, the use of colour, or the combined use of colour and Tallman lettering brought no additional benefit. The findings of the research also suggests that a prior knowledge of the purpose of Tallman lettering is an important factor in determining its efficacy in error reduction. Tallman lettering was also observed to enhance the accuracy of drug name identification amongst distractors in eye tracking studies conducted by Filik et al. (2004). These findings are in agreement with the findings of DeHenau et al. (2016). Tallman lettering was shown to be an effective intervention in allowing confusable name pairs to be detected much more often and much more quickly, both in healthcare providers and laymen; however the beneficial effect was more prominent in healthcare providers. The findings of DeHenau et al. (2016) also suggest that familiarity of both drug names in a confusable pair reduced the beneficial effects of Tallman lettering. It is thought that this may be due to Tallman lettering drawing the attention of an individual to critical parts of drug names. Familiarity of both drugs in a confusable pair might mean that individuals can easily identify differences in the confusable pair, even in the standard lowercase font, thereby abating the effect of Tallman lettering. Similarly, experiments conducted by Darker et al. (2011) also indicate that Tallman lettering can be an effective strategy in improving accuracy in drug name perception. Darker et al. (2011) further tested drug names

written entirely in uppercase text to see how improvements in accuracy differed compared to Tallman lettering. An equivalent improvement in accuracy of drug name perception was observed suggesting that improvements in accuracy may not be due to highlighting distinctive sections of drug names in uppercase, rather the use of uppercase lettering for the whole word may be equally beneficial.

On the contrary research conducted by Schell (2009) and Irwin et al. (2013) suggest that the use of Tallman lettering to enhance accuracy in drug selection provided no additional advantage. Irwin et al. (2013) investigated the impact of Tallman lettering to correctly select a LASA drug from an area containing multiple similarly named and/or packaged drugs. The findings suggest that several LASA drug names in close proximity to one another increased the likelihood of a selection error. Furthermore, a positive effect of Tallman lettering in accurate drug selection was not observed. Similarly, Schell (2009) conducted two experiments to test the efficacy of Tallman lettering as an error reduction strategy. Within-subjects (tests how an individual varies in different test conditions) and between-subjects (tests how individuals in a study vary across different test conditions) designs were employed to test the effects of colour and case enhancement on the identification of LASA drug names. The findings of Schell (2009) are alluding to Tallman lettering being an ineffective approach to enhance drug selection accuracy. Rather Tallman lettering was observed to increase the rate of false alarms; that is where participants reported an error, or a mismatch between the drug names being displayed, when in fact there was not an error. Given the contradictory nature of current empirical evidence for the use of Tallman lettering, and the lack of evidence for other possible textual enhancements, such as use of italics, colour, bold font and contrast, more research is needed to identify strategies to reduce errors associated with LASA drug names.

2.5.3.1.4 Sound and Lighting

Sound levels and lighting can also have a direct impact on the performance of individuals (Buchanan et al., 1991, Flynn et al., 1999). The findings of a study carried out in a high-volume dispensing military outpatient pharmacy, where pharmacists were subject to various intensities of lighting conditions and observed for errors, found

that illumination at 146 foot-candles (foot-candles is a measure of light intensity used mainly in the United States) considerably reduced dispensing error rate compared to the baseline of 45 foot-candles of illumination (Buchanan et al., 1991). The relationship between sound and occurrence of dispensing errors however, is difficult to characterise (Flynn et al., 1999). Flynn et al. (1999) found that two aspects of sound influenced the occurrence of dispensing errors; the nature of the sound and the loudness. The study found that certain types of noises, for example unpredictable sounds and controllable sounds, can reduce dispensing errors. This may be attributable to an arousal effect of the unpredictable and controllable stimuli which can enhance the concentration and thereby improve performance. However, increases in the loudness of sounds resulted in a substantial increase in the rate of dispensing errors to a certain level beyond which loudness did not influence the rate of dispensing errors (Flynn et al., 1999). Thus error occurrence is not directly related to ambient sound (Cohen, 2007, Flynn et al., 1999).

2.5.3.1.5 Physical environment of the dispensary

Pharmacy design, which refers to the spatial design and layout of the dispensary (Peterson et al., 1999) and types of dispensing systems, which refers to manual or automated dispensing, have also been cited as being associated with the occurrence of dispensing errors (James et al., 2009). Over 80% of the dispensing errors reported to the NPSA via the National Reporting and Learning System (NRLS) are those made when selecting an item from a shelf of stock. 'Selection errors' most often involve the wrong strength or formulation of the intended medication or the wrong medication completely (National Patient Safety Agency, 2007). Poorly designed dispensary environments and layouts augment the likelihood of an individual making an error (National Patient Safety Agency, 2007). Open type designs, where the pharmacist and the dispensary space is greatly visible to the patients, can hinder privacy and as such can deter pharmacists from concentrating and consulting literature for safe dispensing (Peterson et al., 1999). Studies looking into the impact of various types of dispensing systems are scarce at present and those that do exist originate from secondary care (James et al., 2011b). The rate of both prevented and unprevented dispensing incidents was considerably lower with Automated Dispensing Systems (ADS) as

compared to manual dispensing. ADSs can be used for computer-controlled storage and dispensing of medications and can be helpful in eliminating content error types as the product selection stage of dispensing is carried out by dispensing robots, whereas manual systems were associated with a variety of content errors (James et al., 2011b). Furthermore, automation at the labelling stage of dispensing through the use of Patient Medication Record (PMR) or Electronic Transfer of Prescriptions (ETP) linked systems can be helpful in reducing dispensing errors (Franklin and O'Grady, 2007). Across the medication processing pathway, errors are most frequent at the transcription stage (Knudsen et al., 2007a) thus reduction of labelling errors through the use of PMR and ETP linked dispensing systems may be a useful approach in reducing error occurrence.

2.5.3.1.6 Work stress and pressures, and working conditions

In the past, little effort was been made to determine the levels of stress in community pharmacy, the causes of work stress and how it may be associated with the occurrence of dispensing errors. As mentioned in section 1.2 the role of community pharmacists has changed in the UK and internationally, with community pharmacists now providing a range of additional health services (Gidman, 2011, Gidman et al., 2007, Johnson et al., 2014). Previous research suggests that community pharmacists perceive higher levels of workload as a result of increasing dispensing volumes and provision of additional services (Bond et al., 2008, Gidman, 2011, Gidman et al., 2007, Hassell et al., 2011, Johnson et al., 2014, Lea et al., 2012, Schafheutle et al., 2011). As a consequence, anecdotal evidence and research suggests that community pharmacists experience higher levels of work stress compared to their counterparts in hospital pharmacy as well as the general working population (Johnson et al., 2014, McCann et al., 2009a).

A large-scale survey (n=1080) conducted by Bond et al. (2008) revealed that 58% (n=762) of community pharmacists felt stressed at work, whilst 24% reported working longer hours since the introduction of the contractual changes. However, it is unclear if the increasing levels of stress in community pharmacy are related to role overload or role conflict (Johnson et al., 2014). The most common factors associated with work-

stress are increasing workloads, target-driven working environments, interruptions, long working hours, lack of rest breaks and inadequate staffing (Bond et al., 2008, Eden et al., 2009, Gidman et al., 2007, Hassell et al., 2011, Lea et al., 2012, McCann et al., 2009a). Furthermore, at present, it remains unclear whether increasing levels of work-stress and pressures adversely impact patient safety and the occurrence of dispensing errors. A large-scale survey conducted by Johnson et al. (2014) found a significant association between perceptions of high workloads and self-reported occurrence of dispensing errors. Work-life balance, nature of job and work relationships were identified as stressors impacting the physical health of community pharmacists, whilst role overload and resources and communication were identified as stressors impacting psychological health.

Poor working conditions and long working longer hours were factors that transpired in the two major dispensing error cases; that of Elizabeth Lee and more recently the case of Martin White. With minimal research looking at working hours in community pharmacy, it is difficult to ascertain a causal link between long working hours and dispensing error occurrence. A survey conducted by the Pharmacists' Defence Association that yielded a response from 1,621 community pharmacists revealed a prevalence of long working hours in community pharmacy (The Pharmacists' Defence Association, 2006). 38% of respondents reported that they worked between 35 and 48 hours per week, whilst 7% reported working over 48 hours per week. Furthermore, the survey revealed a culture of longer working days with 65% of respondents working between 8 and 10 hours (excluding breaks) and 4% working longer than 10 hours per day. In addition to lengthy working hours, the survey revealed a high incidence of a lack of rest breaks taken during the working day; 71% of respondents reported working through the day without taking a rest break of which 50% did so because they were required to by their employers whilst 24% opted not to take a rest break out of necessity. Deteriorating working conditions is a concern often raised by community pharmacists in qualitative studies exploring the impact of increasing levels of workload in community pharmacy (Gidman, 2011, Gidman et al., 2007, Hassell et al., 2011). However, the findings of the survey conducted by the Pharmacists' Defence

Association raise concerns about unsafe working conditions in community pharmacy and their potential association with dispensing error occurrence.

2.5.3.1.7 Staffing and skill-mix

Very little research has investigated the adequacy of staffing levels and skill mix in community pharmacy, and whether this is having an impact on the occurrence of dispensing errors. Whilst insufficient numbers of dispensary support staff and inadequately trained support staff are commonly cited contributory factors in studies investigating dispensing errors in community pharmacy, there is yet no evidence to support that these factors may be influencing the occurrence of dispensing errors (Ashcroft et al., 2005, Flynn et al., 2002, James et al., 2009, Peterson et al., 1999). Since the introduction of the community pharmacy contractual changes, increasing levels of workload have raised concerns over staffing levels and skill mix in community pharmacy (Blenkinsopp et al., 2009, Bullock et al., 2016). Research exploring perceptions of increasing workloads in community pharmacy suggests that staffing levels have failed to keep up with demand arising from increasing levels of workload, thereby adding a work burden to overworked community pharmacists and hindering role expansion (Bullock et al., 2016, Crabtree et al., 2010, The Pharmacists' Defence Association, 2006).

Skill mix and distribution of roles amongst community pharmacy support staff is also an under-researched area (Mullen, 2004). According to the level of training attained, there are three categories of dispensary support staff: Medicines Counter Assistants (MCAs), dispensing/pharmacy assistant and pharmacy technicians and accuracy checking technicians (ACTs) (Bullock et al., 2016). Below are definitions for these roles. Whilst there is a paucity of evidence concerning community pharmacy support staff, their numbers, roles and distribution across various pharmacy settings, the evidence that there is suggests that community pharmacy support staff have not expanded their roles in order to meet the workload demands arising from increasing prescription volumes and provision of clinical services (Mullen, 2004). Despite willingness on the parts of community pharmacists to delegate tasks associated with the dispensing process to members of pharmacy support staff, work-sampling studies

suggest that pharmacists continue to perform dispensing tasks that can be carried out by suitably trained dispensary support staff such as dispensary assistants or ACTs (Davies et al., 2014, McCann et al., 2010, Mullen, 2004). Research conducted by Bullock et al. (2016) found a significant association between the number of dispensary support staff and the number of clinical services provided by the pharmacy; pharmacies with a greater number of technicians provided more clinical services than those without suggesting that making full use of the skill held by support staff is an essential step towards enabling pharmacists' role expansion. At present, due to a dearth of evidence regarding skill-mix in community pharmacy, it remains unclear whether the level of training attained by dispensary support staff involved in the dispensary of prescriptions is an important factor contributing to dispensing errors. Furthermore, more research is needed to identify strategies that can utilise the skill mix of dispensary support staff to better manage community pharmacy workload as a means of error reduction.

Definitions for the roles of dispensary support staff

Medicines Counter Assistant (MCA): A person who has satisfactorily completed or is undertaking an accredited programme of training for work in support of the sale of non-prescription medicines, the receipt of prescriptions, the handing out of completed dispensed items and the provision of advice on health matters.

Dispensing Assistant / Dispenser / Pharmacy Assistant / Assistant Technical Officer: A person involved in a range of pharmacy support activities covered by GPhC minimum competence requirements.

Pharmacy Technician: A person who holds a Pharmacy Services Scottish/National Vocational Qualification (S/NVQ) level 3 qualification or a qualification that has previously been recognised by employers as a valid qualification for pharmacy technicians.

Accuracy Checking Technicians (ACTs): A pharmacy technician whose current training and qualifications are assessed and accredited by the training provider as meeting the defined competencies for their role in final accuracy checking.

2.5.3.2 Social factors

Social factors of the sociotechnical components of work systems in pharmacy and healthcare comprise the relationships and attitudes of individuals in the system towards each other and to the work itself. These include factors such as communication, trust in other staff members and attitudes towards reporting dispensing errors. In community pharmacy, the form of communication most commonly associated with dispensing errors is poor handwriting, although this form of communication has been much reduced by the increasing use of computer-generated prescriptions (Evans et al., 1998). Poor handwriting as a source of error has been cited in numerous studies (Ashcroft et al., 2005, James et al., 2009, Knudsen et al., 2007b). The illegibility and ambiguity associated with poorly written prescriptions then results in the pharmacist making interpretations (Knudsen et al., 2007b). This increases the likelihood of error being carried forward from the transcription stage to the dispensing stage. In instances where a pharmacist attempts to overcome ambiguity by gaining a verbal clarification from the prescriber, various other barriers exist that hinder effective communication. These include the challenge of getting past the 'gatekeeper' (a role most commonly fulfilled by receptionists in GP surgeries), inter-professional barriers in communication influenced by a perceived disparity in professional power between GPs and pharmacists, as well as time constraints (Hughes and McCann, 2003).

Relationships and attitudes of staff are also considered social factors of the sociotechnical system. Whilst increasing staff numbers can reduce pharmacist workload on a technical level, on a social level, assigning more individuals to the same task or responsibility (such as a step of the dispensing process) can result in an increased reliance upon others to carry out the task. This may result in an individual to assume a task has been completed by another member of staff, when it may not have (Wreathall and Nemeth, 2004). Furthermore, an increased degree of familiarity between staff members can contribute to error occurrence in a similar fashion due to the established trust allowing individuals to easily accept one another's judgements (Wreathall and Nemeth, 2004).

2.5.3.3 Individuals factors

Personality traits, gender and state anxiety are also factors associated with an individual that have been shown to have some degree of association with dispensing errors in previous research (Schell and Grasha, 2000, Schell and Reilley, 2004). In a pharmacy-simulated experiment, Schell and Reilley (2004) examined the state anxiety of 75 undergraduate students after they were subjected to a dispensary task. A measure of participants' state anxiety was measured using The State-Trait Anxiety Inventory; a validated tool widely used to measure state anxiety (Schell and Reilley, 2004). The results showed a strong relationship between state anxiety and accuracy of dispensing task with higher levels of anxiety being associated with less accurate performance, thereby producing a greater number of errors. In another pharmacy-simulated experiment, Schell and Reilley (2004) found that personality traits had a modest but significant association between the accuracy of an individual to identify dispensing errors. Research into personality traits and accuracy of performance in other high-risk jobs also suggests a similar association. Likewise, gender was shown to be associated with accuracy of performance in another pharmacy-simulated experiment which showed women tended to work more slowly and more accurately than men (Schell and Reilley, 2004).

The cognitive deficiencies of individuals is also an aspect of individual factors that cannot be completely eliminated; the chances of human error will always remain in tasks where humans are involved (Reason, 1990). Human error and performance can be considered two sides of the same coin: mechanisms at play that precipitate an error are the same as those involved in human performance (Reason, 1990). Whilst human error can never be eliminated, various high risk industries have studied the human error component of incidents and developed ways to minimise its manifestation in systems failures. For example, verbal double-checking procedures, where items are read out aloud from a checklist by one individual and checked by another, are a safety mechanism used by airline pilots as well as healthcare professionals, most notably, radiographers (Toft and Mascie-Taylor, 2005). Various studies within aviation and healthcare safety management have highlighted the propensity for an individual to fail to perform a task despite possessing a belief that they have checked items diligently

when they may not have (Toft and Mascie-Taylor, 2005). Findings within these industries as well as findings from human psychology have introduced the socio-psychological phenomenon of ‘involuntary automaticity’ – which is a reduction in the conscious attention given to a skilled activity when individuals are subjected to adverse operational conditions such as repetition, high workloads, strict time constraints and stress (Toft and Gooderham, 2009, Toft and Mascie-Taylor, 2005). A study by James et al. (2009) looking into the types, causes and contributory factors of prevented and un-prevented dispensing incidents found that 97% of the prevented dispensing incidents had undergone an accuracy check. Moreover, Knudsen et al. (2007a) found that the rate of near-misses was far greater than dispensing error rate and that the highest error rate was for prescription corrections, reflecting that quality control within community pharmacies does play an important role in safety management. Previous research has suggested that whilst accuracy checking is a crucial stage of quality control and error prevention, it is not wholly effective in eliminating errors as 97% of prevented dispensing incidents had undergone an accuracy check (James et al., 2011a, Knudsen et al., 2007a). James et al. (2011a) suggest that this may be due to involuntary automaticity whereby the individual checking may be subject to error-promoting automatism due to repetition of tasks.

2.6 Safety culture in community pharmacy

Pharmacies are organisations that inherently face hazards with potentially life-threatening consequences on a daily basis. From selecting the wrong medication, strength or form, to applying the wrong label or handing medication to the wrong patient, pharmacists use their knowledge and skills to avoid errors that can result in harm or injury. As such, healthcare organisations such as community pharmacy should exhibit the attributes of ‘High Reliability Organisations’ or HROs, such as the military, aviation and nuclear industries. A HRO can be defined as ‘*organisations that face high intrinsic hazards yet perform successfully because they treat safety systematically*’ (Singer et al., 2003). In such organisations, maintenance of safety is paramount for the efficient execution of functions and services. Numerous studies have highlighted the need to adopt a safety culture within healthcare organisations as

an overall approach to tackling issues of safety (Ashcroft et al., 2005, Kirk et al., 2007, Nieva and Sorra, 2003, Nordén-Hägg et al., 2010).

The general definition of safety culture is '*the product of individual and group values, attitudes, perceptions, competencies and patterns of behaviour that determine the commitment to, and the style and proficiency of an organisation's health and safety management*' (Nordén-Hägg et al., 2010). Safety climate forms a subset of safety culture and can be defined as the '*set of attitudes and behavioural norms as perceived by people who work in the organization*' (Phipps et al., 2012). Safety within an organisation can successfully be maintained through the collective establishment of a culture that is open, non-punitive in nature and that propagates an approach that acknowledges any faults whilst promoting engagement of all members of the organisation in maintaining safe practice (Kirk et al., 2007).

Although research has been conducted into the concept of safety culture within various organisations, research examining the relationship between the extent of safety culture and the occurrence of dispensing errors in community pharmacy is limited. Moreover, the guidance and dynamics required to initiate the change for the establishment of a safety culture within this setting is also limited (Nieva and Sorra, 2003). The scope of such research in pharmacy has been confined to prescribing and administration errors (Beso et al., 2005), mainly in the hospital setting with minimal work examining dispensing errors in community pharmacy. Moreover, the vast majority of research in this area originates from the United States and as such relatively little information is available on the UK perspective. This adds a further challenge in identifying the causes of dispensing errors in UK community pharmacies and hence making any suggestions to reduce errors.

2.6.1 Measuring Safety Culture and Error Identification

Safety culture is an important diagnostic tool to assess the quality of care within an organisation and gain a measure of the predictability of error occurrence (Nordén-Hägg et al., 2010). Westrum (2004) proposed that safety culture in essence describes the levels of sophistication of information flow and handling within organisations and

posited a theoretical framework identifying three levels of organisational culture. Within this framework, organisations range from those that do not acknowledge the existence of problems to those actively seeking to find solutions and root out any errors. Organisations were classified as possessing pathological, bureaucratic or generative cultures. Pathological organisations are those that refuse to acknowledge that problems exist and hide failure (Westrum, 2004). On the contrary, generative organisations actively investigate any problems and failures and take responsibility to find solutions (Westrum, 2004). However, bureaucratic organisations fit in between these two extremes; whilst not suppressing the problems as pathological organisations do, these organisations will only deal with problems as they arise (Westrum, 2004).

Based on this, safety assessment frameworks - tools which are used to measure the degree of safety culture within organisations – have been developed as an approach to evaluate the safety culture within community pharmacy. In addition, these tools enable a capture of the various perceptions of safety culture amongst staff and allow an assessment of the factors that influence the safety culture of an organisation (Ashcroft et al., 2006, Kirk et al., 2007). The Manchester Patient Safety Assessment Framework (MaPSaF) is an example that can be used to initiate the development of a generative safety culture in community pharmacies by illustrating the perceptions among staff, stimulating discussion about the strengths and weaknesses of safety culture within the pharmacy and aiding in the identification of areas for improvement (Ashcroft et al., 2006). Similarly, the Safety Attitudes Questionnaire (SAQ) is a validated tool that can be used to assess the safety culture, and has been used in community pharmacy as well as other healthcare settings (Nordén-Hägg et al., 2010).

An important aspect in establishing a safety culture is the identification of the causes of error. As is common practice in high risk industries, various analytical tools have been devised to aid the assessment of the vulnerability of systems to errors and enable the identification of potential causes of errors (Knudsen et al., 2007b, Wreathall and Nemeth, 2004). The critical incident technique has been used in hospital settings to evaluate the causes of dispensing errors (James et al., 2008). It involves

participants describing their experiences and allows an analysis and interpretation of the individual's understanding of their environment (James et al., 2008). Application of this technique identified that errors most commonly occurred at the label generation stage followed by the stock selection phase; a finding supported by other research (James et al., 2008, Knudsen et al., 2007a).

Root Cause Analysis (RCA) takes an analytical approach and identifies the critical causes and contributors to the occurrence of errors and, in the process, provides insights into approaches to managing hazards (Wreathall and Nemeth, 2004). Application of RCA in identifying dispensing errors found that handwritten prescriptions, similarities in packaging, names, strengths and dosages, lack of effective control of prescription labelling due to an over reliance on software and other members of staff, and lack of concentration caused by interruptions are the underlying causes of transcription errors (Knudsen et al., 2007b).

2.7 Reporting of errors

Under the clinical governance requirements of the pharmacy contract, community pharmacies are required to report all incidents that did or could have harmed the patient to the NPSA (Pharmaceutical Services Negotiating Committee, 2017b). The National Reporting and Learning Scheme (NRLS) collects data on adverse events and issues an annual summary report with the statistics. According to data collected since 2003, there has been a slowly increasing trend in reporting errors; however, the overwhelming majority of these reports originate from acute care and hospitals, with reports from community pharmacy being negligible (National Patient Safety Agency, 2009). Ashcroft et al. (2006) conducted a survey of 223 community pharmacists and 52 support staff to examine the likelihood of pharmacists and support staff to report patient safety incidents. The results showed that community pharmacists and support staff are unlikely to report adverse incidents occurring in community pharmacy; however the study fails to indicate the percentage of those who would not report incidents (Ashcroft et al., 2006). Adding further to the causes of underreporting is a fear of censure, time constraints, a lack of knowledge as to what constitutes a safety

incident, along with a fear of breaking inter and intra-professional loyalties (Ashcroft et al., 2006, Nordén-Hägg et al., 2012, Shaw et al., 2005). Moreover, a lack of standardisation of reporting mechanisms and varying degrees of sophistication of reporting systems means that data available are not always uniform, therefore an analysis of the frequency, types and causes of dispensing errors is often challenging (Ashcroft et al., 2006, Shaw et al., 2005).

In attempt to identify what influences error reporting, Tamuz et al. (2004) investigated the influence the propensity of an individual to report an error. Based on a rather simple concept and in line with a non-punitive approach, their study found that redefining the occurrence of events from 'errors' to 'interventions' produced an incentivising effect, promoting openness and creating an environment conducive to learning from safety incidents. On the contrary, classifying the error as a reportable incident produced a disincentivising effect and prevented individuals from reporting the incident. These findings are supported by the findings of Phipps et al. (2009) which found that pharmacists alluded to the informal approaches of error reporting and management and held the opinion that formal reporting should only take place if the matter cannot be resolved informally. Phipps et al. (2009) also suggest that pharmacists may be more willing to engage with a pharmacist 'community of practice' which is 'a social group that fosters collective learning and norms of practice'. Communities of practice are peer-led as opposed to management-led, engaging both the competence and experience of individuals of a common interest for the purposes of collective learning (Wenger, 2000). The abovementioned studies suggest that the adoption of collective and informal approaches towards governance and error-reporting may be an effective way of establishing an open environment in which the reporting of error is maximised. However, a dispensing error in the UK can lead to a criminal offence under section 64 of the Medicines Act 1968. This gives rise to a culture of 'blame' in community pharmacies in which pharmacists are reluctant to engage in error reporting. Therefore a key step in reducing dispensing error would be to establish a non-punitive work environment, where errors are viewed as a symptom of system flaws as opposed to individual fallibility (Mangino, 2004).

2.8 Outcome of dispensing errors

2.8.1 Outcome for patients

Most research looking into dispensing errors in community pharmacy has focussed on studying the incidence, types and causes of dispensing errors. Very little research has been conducted to identify the clinical significance of dispensing errors and the degree of harm caused as a result of errors. An observational study conducted by Franklin and O'Grady (2007) in 11 community pharmacies, assessed the clinical significance of errors detected. The majority of errors (67%, n=64/95) were of minor significance, whilst 32% (n=30/95) were of moderate significance and 1% (n=1/95) were of severe significance. Whilst not specific to the community pharmacy setting, or the dispensary process, a majority (82%) of the incidents reported to the NPSA via the NRLS resulted in no harm (National Patient Safety Agency, 2009). A possible explanation for the higher rate of harm in the study conducted by Franklin and O'Grady (2007) may be due to the fact that the National Patient Safety Agency (2009) reports the medication incidents across all stages of the medication process as well as across all healthcare settings. It does not present data specific to dispensing errors in community pharmacy or to the dispensing process. Given the paucity of evidence of the clinical significance of dispensing errors, it is difficult to compare and analyse previous literature.

2.8.2 Outcome for pharmacists

To our knowledge, to date, no research study has explored the outcome of dispensing errors for community pharmacists and the impact of dispensing errors on the work and personal life of community pharmacists. Research studies looking into the experiences of community pharmacists with increasing workloads have reflected a growing concern amongst community pharmacists towards unsafe working conditions which can potentially precipitate the occurrence of dispensing errors (Eden et al., 2009, Gidman, 2011, Gidman et al., 2007, Hassell et al., 2011, Schafheutle et al., 2011, Seston and Hassell, 2014). However, research studies focussing specifically on the experiences and attitudes of community pharmacists towards dispensing errors within community pharmacy do not exist. Furthermore, there is a paucity of published

evidence about the experiences of community pharmacists after a routine dispensing error has been made and the impact of the error on the pharmacists work, personal life and practice.

In the cases of Elizabeth Lee and Martin White (see section 1.10) which resulted in patient death, the occurrence of the dispensing errors had a detrimental effect on the pharmacists' pharmacy careers, as both pharmacists chose never to subsequently work as a pharmacist (PL, 2016). Considering the fact that the cases of Elizabeth Lee and Martin White resulted in a severe outcome, the choice made by these pharmacists to never work as a pharmacist is to some degree understandable. In effect, Elizabeth Lee and Martin Lee, once successful pharmacy professionals, became second-victims of their own errors. A second victim can be defined as a health care provider whose inadvertent error that has resulted in patient harm or death leaves him/her traumatised by the events and feeling personally responsible (Santomauro et al., 2014). Prior research looking into second-victimhood suggests a prevalence of one in ten healthcare practitioners (Santomauro et al., 2014).

Not specific to pharmacists, the emotional side effects of a medical error experienced by healthcare practitioners range from shame, self-blame, self-doubt and loss of sleep (Dekker, 2009, Santomauro et al., 2014). Despite such strong effects, it is thought that only one in four healthcare practitioner receives the necessary institutional support to deal with the stress (Santomauro et al., 2014). An unanswered need for support for the healthcare practitioner is a symptoms of a pathological organisation in which a poor safety culture means system failure precipitate conditions where errors are incidents waiting to happen. It may be argued that second victimisation stems from a culture of perfection and infallibility prevalent in healthcare, fuelled by fears of humiliation, shame and public scrutiny and disciplinary action and punishment (Santomauro et al., 2014). Therefore efforts to create a non-punitive healthcare environments would require a cultural shift as well as a shift in the professional identity of healthcare professionals (Santomauro et al., 2014).

2.9 Summary of literature and gaps identified

This literature review has considered the quantitative estimates of dispensing errors, the types and causes of dispensing errors as well as the consequences after an error takes place. It has also highlighted the complexities involved in identifying the causes of dispensing errors as well as the approaches that can be taken to design work systems to minimise error. However, gaps remain in the literature. For example, with regards to the occurrence of dispensing errors within community pharmacy, research has mainly focussed on employing self-reporting or observational methods of data collection, where errors are identified before the medication has been supplied to the patient/representative and thus reflecting potential dispensing errors. Along with the bias associated with self-reporting and observational studies, these approaches to dispensing errors research do not reflect the profile of actual dispensing errors. This literature review also found a paucity of research regarding the outcome of dispensing errors, for patients as well as the pharmacist. At present very little is known about the clinical outcome of dispensing errors for the patients involved and the degree of harm caused. Any data that does exist originates from error reporting schemes not confined solely to the dispensing process, therefore not directly applicable to dispensing errors research. With regards to the outcome of dispensing errors for the pharmacist, there is no previous study that has researched the impact of dispensing errors on the pharmacist's work and personal life, their dispensing practice, or their well-being. Whilst a number of research studies, mainly qualitative, have been conducted to investigate the impact of increasing workloads and stress in community pharmacy, previous literature has not investigated the experiences of community pharmacists during a dispensing error nor have they focussed on the ways in which the working environments of pharmacists can precipitate in dispensing errors. This project aims to address these gaps in literature as well as to provide a comprehensive insight into the occurrence of dispensing errors in community pharmacy.

2.10 Aims and Objectives

The aim of this research is to investigate the occurrence of dispensing errors in community pharmacy and explore the experiences and attitudes of community pharmacist in ensuring accuracy during the dispensing process. This aim raises the following core project objectives:

1. To investigate the nature, types and causes of dispensing errors in community pharmacy.
2. To investigate the outcome of dispensing errors for patients.
3. To investigate the outcome of dispensing errors for pharmacists.
4. To explore the experiences and attitudes of community pharmacists during a dispensing error.
5. To explore the impact that dispensing errors have on the community pharmacists' work and personal life and dispensing practice.
6. To identify dispensing error prevention strategies
7. To identify predictors of dispensing errors in community pharmacy

Chapter 3

Methodology

3.1 Overview of the chapter

This chapter describes the research methodology and the specific methods used for this research. First an essential background of mixed methods research is provided followed by an explanation as to why it has been chosen for this programme of research. The subsequent sections describe the data collection phases for this research which consisted of a retrospective database analysis, semi-structured face-to-face interviews and a cross-sectional survey. Before an explanation is presented about the rationale behind the chosen research method for this PhD, a brief introduction will be given into logics of inquiry of scientific research and their theoretical underpinnings.

3.2 Epistemology and Theoretical Underpinnings of Scientific Research

3.2.1 Background

An attempt to answer some question that we are uncertain of is a scientific inquiry. According to Kuhn and Hacking (2012), a scientific inquiry is based on a particular paradigm, which is a comprehensive belief system, worldview or framework that guides research and practice in a field (Slevitch, 2011). The concept of paradigm was first popularised by Thomas Kuhn to explain how science operates and develops over time (Morgan, 2007, Sommer Harrits, 2011). A paradigm can be defined as a basic belief system or worldview that guides the investigator not only in methods but in ontologically and epistemologically fundamental ways (Guba and Lincoln, 1994). Ontology and epistemology are both branches of philosophy; the former being the philosophy of reality i.e. 'what is reality?', and the latter being the philosophy of knowledge i.e. 'how can we come to know the reality?' (Krauss, 2005). Established from ontology and epistemology is methodology which can be defined as a theoretical

and philosophical system that dictates the way research is conducted (Slevitch, 2011). Thus methods can be defined as a set of procedures or techniques employed to investigate a scientific inquiry (Smith and Heshusius, 1986).

3.2.2 Qualitative and Quantitative Epistemology

Traditionally the qualitative and quantitative research methodologies have been thought to originate from two different research paradigms; the interpretive and the positivist respectively. Thus they differ not only in the methods but also in their ontology and epistemology (Slevitch, 2011). The quantitative paradigm is said to be based on positivism which holds the view that all phenomena can be reduced to empirical indicators representing the truth (Sale et al., 2002). Ontologically, the positivist paradigm assumes that there is a single truth, an objective reality that is independent of human perception (Sale et al., 2002). In terms of the epistemology, the quantitative paradigm holds that the investigated and the investigator are independent entities that have no influence upon one another (Sale et al., 2002). The qualitative paradigm on the other hand, is based on an interpretivist approach, which views human behaviour as complex and fluid, and not of a fixed pattern (Hammersley, 2003). In terms of the ontology, the interpretivist paradigm assumes that multiple realities exist based on an individual's construction of reality, that reality is socially constructed and constantly undergoing change (Sale et al., 2002). Due to this belief that reality is the product of an individual's construction, epistemologically, the interpretivist paradigm posits that findings are mutually created within the context that shapes the inquiry due to the investigator and the investigated being interactively linked with one another (Lincoln et al., 2011, Sale et al., 2002). Table 7 below compares the qualitative and quantitative paradigms.

Table 7 Comparison of Quantitative and Qualitative Approaches (Slevitch, 2011).

	Quantitative Approach	Qualitative Approach
Worldview (paradigm)	<ul style="list-style-type: none"> • Realism/positivism • God's view – separation of mind from reality 	<ul style="list-style-type: none"> • Idealism/Constructivism • Constructed reality – various people's point of view
Ontology (views on reality)	Single, objective and independent reality exists and it can be known or described as it really exists	Multiple social realities exist, these are mind-dependent and cannot be described free from people's points of view, particular interests, values, and purposes
Relationship between facts and values	Facts can be separated from values due to separation of mind and world	Social inquiry cannot be value-free, therefore, facts cannot be separated from values
Epistemology (views on knowledge)	<p>Dualist/objectivist</p> <ul style="list-style-type: none"> • Knowledge is summarized in the form of time-, value-, and context-free generalizations. • Truth is a correspondence among the data and the independently existing reality. • Validity corresponds to how reflective of reality and generalizable results are; matter of prescribed techniques properly applied. 	<p>Subjectivist</p> <ul style="list-style-type: none"> • Reality is only knowable through human mind and through socially constructed meanings. • Truth is a matter socially constructed agreement. Truth refers to how inquirer's statements correspond to how people out there really interpret or construct their realities. • Validity refers to credibility, description with which one agrees. Valid means "makes sense," given one's interests and purposes.
Methodology (aims of scientific investigation)	<p>Experimental/manipulative</p> <ul style="list-style-type: none"> • Aiming at objectivity and generalization through finding causal effects that allow prediction. • Sample size is critical for generalization purposes. 	<p>Hermeneutical/dialectical</p> <ul style="list-style-type: none"> • Aiming at understanding phenomena from the point of view of those being studied. • Sample size is irrelevant; transferability of findings depends on data richness and interpretation
Methods (research techniques and tools)	Empirical examination and measurement, hypothesis testing, randomization, blinding, structured protocols, questionnaires, etc.	Ethnographies, case studies, narrative research, interviews, focus groups, observations, field notes, recordings, filmings, etc.

3.2.3 Incompatibility Thesis

Up until the early 20th century, most research in the social sciences was of a quantitative nature, consistent with the approach taken to study the natural sciences (Allwood, 2012). However, application of the quantitative approach to study social phenomena challenged the relationship between the social and the natural world and raised the question of whether the quantitative approach was suitable to study social phenomena (Hammersley, 2003). This was argued by Dilthey who stated that human social life is more complex than the physical world; the fundamental difference being the subject matter between the natural and social worlds (Hammersley, 2003, Smith and Heshusius, 1986, Weber, 2017). He explained that the natural sciences can be viewed as a world of external, objectively knowable facts, i.e. a series of inanimate objects that exist outside of us (Smith and Heshusius, 1986). On the other hand, the moral sciences focused on the products of the human mind as these products were intimately connected to human minds with all their subjectivity, emotions, and values (Smith and Heshusius, 1986).

Dilthey's view was that it is impossible to separate the relationship of what was being investigated and the investigator due to his understanding of social reality being the result of conscious human intention; and so he challenged the positivist approach (Smith and Heshusius, 1986). Thus throughout most of the 20th century, the quantitative and qualitative paradigms were viewed as conflicting and competing with one another, which gained ground from Dilthey's argument (Smith and Heshusius, 1986). Weber (2017) recognised Dilthey's position and put forward the argument of whether there could be anything such as a correct interpretation and as a proposed solution to resolve the problem, Weber attempted to bring together the two perspectives (Smith and Heshusius, 1986).

This period led the way to decades of heated debates or 'paradigm wars' that discussed the incompatibility of combining the quantitative and qualitative paradigms as a means of answering a scientific inquiry. The 'incompatibility thesis' suggests that the two approaches could not and should not be mixed, not merely due to differences at the level of technique but due to more deep rooted ontological and epistemological

reasons, as Guba states that *'one [paradigm] precludes the other just as surely belief in a round world precludes the belief in a flat one'* (Howe, 1988, Sale et al., 2002, Smith and Heshusius, 1986). Since methods can be characterised not only as the procedures and techniques, but also as the 'logic of justification', which is the explanation given in support of practice, the difficulties are founded in logics of justification (Slevitch, 2011, Smith and Heshusius, 1986). It was viewed that the two perspectives define truth differently, thus the underlying philosophical assumptions between the two logics of justification were incommensurable (Smith and Heshusius, 1986). However, the work of Guba was significant in that he tried to find the middle ground. Whilst Guba maintained that the two approaches differ at the paradigm or philosophical level, Guba's proposed solution began the de-epistemologisation of the paradigms (Howe, 1988, Sale et al., 2002, Slevitch, 2011). The focus of Guba's solution was to show little interest in the assumptions and more interest in the techniques and procedures (Sale et al., 2002). This is further argued by Howe who rejects that incoherence between the quantitative and qualitative paradigms exists (Howe, 1988). Howe's view of methods and paradigms is that of a two way relationship; that paradigms should be evaluated in terms of how well they meet with the demands of research practice (Howe, 1988). Thus through a combination of avoiding assumptions and parallel development of methods, both the quantitative and qualitative methods can be coherently mixed as a means of a scientific inquiry (Howe, 1988).

3.2.4 Theoretical perspective of Mixed Methods Research

It has been claimed that mixed methods research is the third major research paradigm (Denscombe, 2008, Johnson et al., 2007). Since it emerged in the 1990s, the mixed method research paradigm has rapidly gained popularity (Denscombe, 2008). Traditionally the research paradigms have been viewed as dichotomous, either falling in the quantitative or the qualitative category.

Purists who identify themselves as purely quantitative or qualitative researchers, advocate the 'incompatibility thesis', which as explained above, posits that accommodation between the quantitative and qualitative research paradigms, along

with their research methods, is impossible (Johnson and Onwuegbuzie, 2004). However, Johnson et al. (2007) view mixed methods research as falling at some point along the quantitative-qualitative continuum, thus attempting to respect the wisdom in both perspectives, and rejecting the incompatibility thesis (O'Cathain et al., 2007). Miles and Huberman (1984) state that '*epistemological purity doesn't get research done*' implying that the philosophical debate concerning the use of quantitative and qualitative methods is not one that will be resolved in the near future and so researchers should focus on developing methods that are suited to the research questions. The mixed methods research paradigm is associated with the philosophy of pragmatism (Dures et al., 2011). The roots of pragmatic philosophy can be traced back to the American philosopher Charles Sanders Pierce, and were later elaborated on by various philosophers including William James, John Dewey, George Herbert Mead and Arthur F. Bentley (Tashakkori and Teddlie, 2003). The theoretical perspective of pragmatism is that the complex nature of social phenomena can be understood through the use of various approaches. According to the pragmatic philosophy, there are not only multiple ways of making sense of, and understanding the social world but that there are multiple perspectives or viewpoints on what is important and valuable (Greene, 2008). Pragmatism places an emphasis on 'truth is what works at the time', therefore researchers may use both the quantitative and qualitative paradigms in a manner which meets the needs of the research objective.

3.2.5 Qualitative and Quantitative Research Methods

As discussed above, the qualitative and quantitative perspectives differ in their philosophical foundations. However, their differences go beyond the philosophical debate. The qualitative and quantitative research paradigms differ also in terms of the research design, the type of data collected, the sampling procedures, the analysis of data as well as the logic of reasoning (Punch, 2013).

Over the last 40 years, there has been a large increase in the use and acceptability of qualitative research methods (Hammersley, 2003). The qualitative research paradigm is concerned with meaning; it attempts to understand how people make sense of the world and their experiences (Willig, 2013). Instead of identifying a cause-effect

relationship, the objective of qualitative research is to describe the quality and texture of experience, not to predict it (Willis and Jost, 2007). Since qualitative research focuses on the attributes given to events by the research participants themselves, it can be viewed as giving a voice to those whose accounts tend to be marginalised or discounted (Willig, 2013). Whilst working alongside the research participants to make sense of, and draw meaning from their point of view, qualitative research is also a reflexive approach in that the role and perspective of the researcher is also acknowledged (Ritchie et al., 2013)).

According to Punch (2013) qualitative and quantitative research can be viewed on a continuum of pre-specified – where the research design, research questions and data to be gathered are pre-determined and tightly structured, and unfolding – where the research design, research questions and data to be gathered are loosely structured and emerging as the research unfolds. Qualitative research more often falls on the unfolding end of the continuum as some empirical work must be carried out to identify the research questions (Punch, 2013). Qualitative research techniques involve gathering, analysis, interpretation and presentation of narrative information thus the type of data most often associated with qualitative research tends to be words or images rather than numerical data (Ritchie et al., 2013, Teddlie and Tashakkori, 2009). Analysis of qualitative data involves thematic data analysis using a variety of inductive and iterative techniques, which often results in the emergence of key themes (Teddlie and Tashakkori, 2009). In terms of the logic of reasoning, qualitative research is said to employ inductive logic, which involves building knowledge from the bottom-up through observations of the world, which in turn provide the basis for developing theories (Ritchie et al., 2013). Thus qualitative research is most often associated with theory and/or hypothesis generation (Punch, 2013).

On the contrary, the quantitative research paradigm seeks to describe, predict and control behaviours (Borland, 2001). A basic assumption of the quantitative paradigm is that all behaviours are predictable and that events occur consistently in relation to one another, therefore specific variables can be isolated through the control of environment and sampling techniques in order to eliminate confounding variables and thus identify the relationship between specific behaviours (Borland, 2001). Unlike the

qualitative research paradigm, the quantitative research paradigm seeks to quantify relationships in order to explain behaviours and identify relationships that can be used to predict behaviours (Borland, 2001). Whereas the qualitative research paradigm studies the individual participant in detail, the quantitative paradigm focuses not on the individual human being but a specific population of individuals (Borland, 2001).

In terms of research design, quantitative research falls on the pre-specified end of the pre-specified-unfolding continuum, whereby the research questions and data to be collected are pre-planned and set up in advance (Punch, 2013). As a technique, quantitative research is associated with gathering, analysis, interpretation and presentation of numerical information (Teddlie and Tashakkori, 2009). Data are analysed using numerical and statistical techniques in order to either describe the phenomena of interest or identify significant differences between groups or among variables (Teddlie and Tashakkori, 2009). By measuring the observable social realities, quantitative research seeks to test hypotheses developed from existing theory, thus it is often regarded as theory verification (Punch, 2013). In terms of the logic of reasoning, quantitative research is a deductive logic. It is a topdown approach to knowledge because hypotheses are tested by observation to be either confirmed or rejected, thereby strengthening or weakening the theory (Ritchie et al., 2013).

3.2.6 Mixed Methods Research

Since the 1990s there has been a rapid increase in the interest and use of mixed methods research (Punch, 2013). This increase in the use of mixed methods research has also been observed within the healthcare field. For example, one fifth of the health services research funded by the Department of Health (DOH) in England between 1994 and 2004 were mixed methods research studies (O'Cathain et al., 2007). However, use of mixed methods research within pharmacy practice research is still limited (Hadi et al., 2014). A mixed methods approach can be defined as, '*a research design (or methodology) in which the researcher collects, analyses and mixes (integrates or connects) both quantitative and qualitative data in a single study or a multiphase program of inquiry*' (Creswell, 2013). By combining the strengths of both the qualitative and quantitative paradigms, the mixed method approach allows the

deficiencies associated with each to be compensated (Creswell, 2013, Punch, 2013). Mixed methods approaches are used where research requires both a measurement as well as a greater understanding of the nature or origins of the issue (Ritchie et al., 2013). In doing so, the mixed methods approach can make-up for the methodological blind spots associated with the qualitative and quantitative methods, reveal the different dimensions of a phenomena and enhance and enrich the understanding of the multi-faceted nature of social phenomena (Ritchie et al., 2013). Mixed methods research may be conducted for a range of reasons, as identified by Greene et al. (1989), these may be triangulation (seeks to corroborate results from different methods), complementarity (seeks to enhance and clarify the results of one method with the results of another), development (use the results of one method to help inform or develop the other method, initiation (seeks the discovery of new perspectives of frameworks by comparing the results of one method with the other) and expansion (seeks to increase the breadth and range of research by using different methods at different stages of research). In terms of logics of inquiry, the mixed methods approach may adopt inductive reasoning (identifying patterns), deductive reasoning (theory testing) or abductive reasoning which seeks to find the simplest most likely explanation (Johnson and Onwuegbuzie, 2004). Analysis of mixed methods research data involves the integration of both statistical and thematic data analysis techniques.

Mixed methods research designs can vary in the degree of mixing of qualitative and quantitative approaches in a study. Either of the approaches may be given priority over the other, or they may be given equal priority. The degree of mixing of the approaches depends largely on the needs of the research topic. Mixed methods research designs may also vary in terms of time orientation of the quantitative and qualitative approaches. The qualitative and quantitative approaches may either be carried out sequentially (where a quantitative phase is followed by a qualitative phase or where a qualitative phase is followed by a quantitative phase) or concurrently (where the quantitative and qualitative phases are carried out simultaneously).

3.3 Justification for a mixed methods approach for this PhD

This project employed a mixed method approach, underpinned by pragmatism, in an attempt to provide both a broad and in-depth understanding of the rates, reasons and consequences for dispensing errors in community pharmacy as well as the attitudes and experiences of community pharmacists towards dispensing errors. As previously mentioned, the aim of this doctoral research is to provide both an understanding of the epidemiology, taxonomy and predictors of dispensing errors as well as the experiences and attitudes of community pharmacists towards dispensing errors. Therefore, both a quantitative measure of dispensing errors as well as a meaningful insight into the experiences and perspectives of community pharmacists were necessary to provide a complete and enhanced understanding of the research question. The qualitative analysis was utilised to gain an in depth and meaningful insight into the experiences and perceptions of community pharmacists towards dispensing errors. The quantitative approach was used to provide an objective measure of the nature, outcome and possible explanations for dispensing errors. By combining the results of both approaches, this project provides a holistic view of dispensing errors in community pharmacy as well as a comprehensive data profile on the occurrence of dispensing errors in community pharmacy. Of the five purposes of mixed methods research identified by Greene et al. (1989), the present research is justified with the complementarity intent, that is, the qualitative and quantitative methods are used to measure both overlapping as well as different aspects of dispensing errors in community pharmacy, in attempt to provide an enhanced understanding of the research questions. In doing so, this research demonstrates one of the fundamental rationales of conducting mixed methods research – that by using both quantitative and qualitative research methods, the strengths of each method compensates for the other's weakness.

An exploratory sequential design, divided in three distinct phases was adopted for this research project. The first phase was divided into two stages – a quantitative stage and a qualitative stage, which informed the development of an instrument for the

second phase. This was followed by a qualitative phase used to inform the development of the instrument for the final quantitative phase. The phases of research are represented below:

quan+qual (phase 1) → QUAL (phase 2) → QUAN (phase 3)

3.4 Phases of Research

A brief description of each of the three phases of research conducted is provided below.

3.4.1 Phase 1: Retrospective Database Analysis

This study adopted a retrospective approach to analyse the 'Incident Report Forms' (IRF) from the database of an indemnity insurance provider, the PDA. As part of the indemnity insurance cover, pharmacists are required to report all dispensing errors to the PDA. When reporting dispensing errors, the member is required to complete an Incident Report Form (IRF) which gathers data about the details of the error as well as the environment in which the error took place. Because an IRF is completed whenever a pharmacist reports a dispensing incident, regardless of whether a clinical negligence claim is processed, the database is a key data source.

This phase of research was carried out in two stages. Stage one was a quantitative study involving the collection of information on the nature, outcome and possible explanation for the dispensing errors from the IRF. Responses to the questions on the IRF were collected on a data collection form and quantitatively analysed to produce descriptive statistics. In the second stage of the study, a qualitative analysis was performed on the detailed description of the incident provided in selected IRFs to obtain context based data about the possible explanation and predictors for the occurrence of dispensing errors.

3.4.2 Phase 2: Qualitative Research Interviews

This phase of research explored pharmacist perceptions of the factors which contribute to dispensing errors, experiences following a dispensing error and the impact that these experiences have had on the pharmacist's practice using semi-structured interviews.

3.4.3 Phase 3: A cross-sectional survey of community pharmacists

The final phase of research was a cross-sectional survey using a questionnaire examining the experiences and attitudes of practising pharmacists towards errors and their role in ensuring patient safety during the dispensing process. Community pharmacists from the database of an indemnity insurance provider were invited to take part in the survey. Data were collected using a carefully structured questionnaire, devised from the results of study 1 and study 2.

Chapter 4

Retrospective Database Analysis

4.1 Introduction

The previous chapter justified the mixed methods approach as the preferred choice of this research project. This chapter presents the first phase of the project which was divided into two parts – the first, a retrospective database analysis and the second, a thematic analysis of IRFs. The choice of methods, data collection, statistical tests and thematic analysis are discussed. Finally, the results of both the quantitative and qualitative stages of phase 1 are discussed.

4.2 Background

After the National Insurance Act of 1911, dispensing of medicines began to dominate the role of the community pharmacist aside from the compounding of medicines and the provision of advice (Anderson, 2015, Kremers and Sonnedecker, 1986). However, it was not until after the establishment of the National Health Service in 1948, that the community pharmacist became the primary dispenser of medicines in the community and, today dispensing of medicines continues to dominate the role of a community pharmacist (Anderson, 2015, Kremers and Sonnedecker, 1986). Between 2012 and 2013, of the 1.04 billion prescriptions dispensed in the community, 91% were dispensed by community pharmacies (Health and Social Care Information Centre, 2013).

At present, dispensing of medicines is one of the essential services provided by community pharmacists under the community pharmacy contractual framework for community pharmacies. In 2005, changes were made in the contract in order to increase the utilisation of community pharmacy as a venue for health improvement and to direct the activity of community pharmacists towards the provision of clinical services and away from the dispensing of medicines (Department of Health, 2003). However, as discussed in chapters 1 and 2, research suggests that the contractual

changes have made little impact on shifting the role of the community pharmacist away from the supply of medicines to the provision of clinical services and, as such, dispensing continues to remain the predominant feature of the pharmacist's role (Eden et al., 2009). Recent studies suggest that the introduction of the new contract has been associated with a large increase in workload and that this has been accompanied by an increase in stress and work pressures, and a decrease in job satisfaction (Bond et al., 2008, Gidman, 2011, Hassell et al., 2011). With future aims of further shifting the pharmacists' role towards the provision of clinical services (Anderson, 2000), it is unclear how pharmacists are coping with carrying out both the supply and clinical functions effectively, and how this is impacting the ability of pharmacists to ensure accuracy and clinical safety during the dispensing process.

In recent years, there has been a growing interest in the study of dispensing errors. However, most studies have attempted to quantify the rate of dispensing error occurrence and identify the causes and types of errors rather than provide a comprehensive overview of the nature, outcome and predictors of dispensing errors. A review of internationally published literature found that prevented dispensing incidents (errors that are detected within the pharmacy before medication had been issued to the patient) occurred at a rate of 0.22-0.48%, whilst unprevented dispensing incidents (errors that are detected after the medication has been issued to the patient and left the pharmacy) occurred at a rate of 0.04-3.32% (James et al., 2009). Furthermore, of the unprevented dispensing incidents, the most commonly occurring were supply of the wrong item, strength or formulation, and printing the wrong directions on the label (James et al., 2009). The factors that most commonly contributed to the errors were a high workload, similar drug names, similar packaging, low staffing levels, interruptions, and poor handwriting (James et al., 2009). However, previous studies have relied on self-reporting and observational methods of data collection, which may be an underestimate of the actual frequency of dispensing errors. Self-report methods can grossly underestimate the actual error rate due to numerous reasons. First, as mentioned in Chapter 2, self-report methods are associated with 'social-desirability' and 'recall' biases, where either knowingly or unknowingly the participants underreport the dispensing errors. Second, under-

reporting may also arise as a result of the participant making a judgement as to the degree of triviality of the error, or appropriateness/convenience to report the error (e.g. during busy times of the day) and then subsequently not report. Third, actual dispensing errors that have been made but not been brought to the attention of the pharmacy will also go unreported. Similarly, observational methods may also be associated with bias and confounding factors. Voluntary participation and small sample sizes may result in under-reporting the occurrence of dispensing, which can reduce external validity of observational research findings. For example, pharmacists who believe they have a low error rate may be more willing to participate than those who do not. Furthermore, smaller sample sizes means that the results may not be generalizable to the overall population of community pharmacists. The Hawthorne effect is a confounding factor associated with observational studies resulting in participants to change their behaviour in the presence of an observer (James et al., 2009).

The consequences for the pharmacist after the occurrence of a dispensing error can vary from an investigation by the employer or the local NHS body to civil or, in the most serious cases, criminal proceedings. The route of investigation taken depends on the degree of harm caused and/or the patient's decision to take the matter further. In the majority of cases, the error will be identified before any harm is caused and no further action will be taken (Langley, 2013). However in cases where the dispensing error has resulted in some degree of harm to the patient, the patient can pursue a civil claim to gain some form of financial compensation and/or report the matter to the professional regulator, the GPhC (Langley, 2013). In the instance that the degree of harm is so severe that the patient dies, a criminal investigation may be necessary for the charge of gross negligence manslaughter or for prosecution under section 64(1) of the Medicines Act 1968, (Langley, 2013). Therefore, an incorrect supply of a medicinal product, other than that requested on prescription would be considered a criminal offence in breach of section 64(1) (Langley, 2013).

Standard 7.9 of the GPhC's Standards of Conduct, Ethics and Performance states, 'make sure that all your work, or work that you are responsible for, is covered by appropriate professional indemnity cover' (General Pharmaceutical Council, 2010).

Thus it is a requirement of the pharmacy regulator that a practising pharmacist be covered by professional indemnity arrangement. As part of the cover agreement, pharmacists are required to report any dispensing incident to the cover provider. This study sought to explore the factors that contribute to dispensing errors using instruments from the database of a provider of pharmacist indemnity insurance. A retrospective approach was employed to analyse the IRFs from the database of an indemnity insurance provider, namely, the Pharmacists' Defence Association (see chapter 1) which are completed by pharmacists when reporting dispensing errors. Because an IRF is completed whenever a pharmacist reports a dispensing incident, regardless of whether a clinical negligence claim is processed, the database is a key data source for actual dispensing errors that have taken place. The data contained within the IRF relevant to this study includes:

- The nature of the incident
- A detailed description of the incident
- The location (type of pharmacy, e.g. supermarket pharmacy, high street pharmacy)
- Time of day at which the incident took place
- The intensity of business (prescription volume dispensed per month, the number of prescriptions dispensed on the day of the incident)
- Aspects of the work environment which could have contributed to the error (e.g. layout of the dispensary, stock storage, staffing, computer systems and protocols)
- Employment status of the pharmacist (Locum/employee), the number of hours worked on the day of the incident, the number of hours worked seven days prior to the incident, and the number of rest breaks taken during the day.

4.3 Aim

The study aims to examine the nature and outcome of dispensing errors and explore the possible explanations for error occurrence using data captured by the Incident Report Forms from the database of an indemnity insurance provider, the PDA.

4.4 Ethics considerations

The present study involved access to data from the database of a pharmacist indemnity insurance provider, the PDA, for which a confidentiality agreement was completed.

4.5 Methods

4.5.1 Design structure

A retrospective approach was taken to analyse a purposive sample of the IRFs from the indemnity insurance database of the PDA. The study was carried out in two stages. Stage one was a quantitative study involving the collection of information on the nature, outcome and possible explanation for the dispensing errors from the IRFs. Responses to the questions on the IRF were collected on a data abstraction form and quantitatively analysed to produce descriptive statistics. In the second stage of the study, the findings of the quantitative stage were supplemented with qualitative analysis of the detailed description of the incident provided in the IRF to inform and better understand the associations observed between the variables in the quantitative analysis.

4.5.2 Rationale for retrospective research methods

A retrospective approach was employed to conduct a quantitative and qualitative analysis of the IRFs held on the database of the PDA. Studies adopting a retrospective approach collect data about past events and examine factors related to an outcome that has been established at the start of the study (Jupp, 2006). Research investigating medical errors suggests that retrospective data collection can be considered to be a useful approach to studying factors associated with medical errors (Weinger et al., 2003). Retrospective research often requires analysis of secondary sources of data that were originally collected for reasons other than research, by individual(s) other than the researcher and independent of any specific hypothesis (Gearing et al., 2006, Mann, 2003). As a pre-existing (secondary) data source, the IRFs held on the PDA

database were considered to be a useful and convenient source of data to study dispensing errors in community pharmacy.

Several advantages were considered for conducting a retrospective analysis of IRFs to investigate the nature, contributory factors and predictors of actual dispensing errors that have taken place in community pharmacy. First, the main advantage of using the IRFs was that it would be comparatively fast and inexpensive as the data was readily accessible from the existing PDA database. Second, the PDA database holds almost 4000 closed cases that have been handled since 2006 to present. This allowed for a large sample size to be obtained over a long time period. Third, since the PDA has registered members from all over the UK, use of the database allowed for a larger geographic coverage of dispensing error cases, which would give a broader picture of the occurrence of dispensing errors in community pharmacy. Fourth, retrospective research was considered to be an unobtrusive approach which meant that data could be collected without the researcher being in direct contact with community pharmacists or within community pharmacies. Since the data were originally collected by someone other than the researcher, observer bias is diminished.

Disadvantages of the retrospective approach were also taken into consideration. Due to the fact that the data were originally collected for purposes other than research, they may lack rigour as all the necessary and relevant information may not be contained within the IRFs. Similarly, the study may also suffer from sampling bias due to the missing desired data elements, possibly because pharmacists chose not to answer those questions in the IRF, or because the information required to complete the IRF was not at their disposal at the time of completing the IRF. Another downside of retrospective research is that it may be associated with recall bias (Hess, 2004, Jupp, 2006, Mann, 2003). One aspect of recall bias is that an individual relies on memory to report past events, which in the case of the present study was dispensing errors. Depending on the latency period between the occurrence of the error and the time when the IRF was completed, the degree of detail to which pharmacists could remember and recall the errors was susceptible to variation. Another aspect of recall bias is that individuals have a tendency to reconstruct the past in light of present

circumstances and as such are likely to exaggerate or minimise certain aspects of their experiences, for example, they may exaggerate or minimise certain risk factors in comparison to others (Jupp, 2006, Mann, 2003).

In retrospective study designs, due to the inherent biases and confounding factors associated, cause and effect cannot be established between variables (Hess, 2004, Jupp, 2006, Mann, 2003). However, minimising the confounders and biases can improve the rigour of research conducted (Gearing et al., 2006). This can be achieved through developing clear guidelines and protocols for data abstraction, using a data abstraction instrument and assessing the feasibility of the planned investigation by conducting a pilot study (Gearing et al., 2006). Furthermore, retrospective research studies can highlight relationships and associations between variables and be useful in generating hypotheses (Gearing et al., 2006, Hess, 2004, Jupp, 2006). This can be particularly useful in exploratory research or as part of a larger research programme where a retrospective study design can highlight interesting relationships that warrant further investigation (Rao and Richard, 2012).

4.5.3 The PDA database and the IRFs

The PDA database has around 4000 number of closed cases of dispensing errors. A case in the database can be described as the record detailing the dispensing error along with any associated documents e.g. copies of the prescription, correspondence and the IRFs. The extent to which these errors were investigated varied considerably. Some errors were reported merely to comply with the indemnity insurance cover requirements with no form of investigation, whilst others were investigated by the employers but did not progress to a clinical negligence claim. Finally, a minority of cases were those that progressed to a clinical negligence claim and thus were extensively investigated. The IRFs were composed of two parts: part one gathered data relating to the details of the dispensing error, the patient and the pharmacist, whereas part two was the 'Environment Questionnaire' which gathered data relating to the dispensary environment in which the error took place. The amount of information contained within each file varied considerably too: some cases contained both parts of the IRF completed to a good level, some contained either part of the IRF only, and

finally some cases were closed due to lack of response from the pharmacist. This meant that the amount of missing data within each case varied considerably between cases. However, using the database for data collection was an arduous task as there was no way of extracting data using an automatic search option. This meant that each case had to be opened individually and inspected, which was a time consuming task.

4.5.4 The quantitative study

4.5.4.1 Sampling

Purposive sampling is a type of non-probability sampling which involves 'selecting certain units or cases based on a specific purpose rather than randomly' (Teddlie and Yu, 2007). Unlike probability (randomised) sampling, non-probability sampling does not seek to represent the case groups in their true proportions in the study sample, therefore does not aspire to statistical generalisability or representativeness (Barbour, 2001, Ritchie et al., 2013). Purposive sampling is useful for pilot studies, when the study involves labour-intensive cases, where a large size of the study means it is difficult to get a probability sample or where no other method of sampling is available (Bernard and Bernard, 2012).

For the present study, purposive sampling was selected as the most appropriate approach to sampling for numerous reasons. First, missing data in the IRFs was a key problem in ensuring data quality. Therefore, as a means of ensuring a more comprehensive overview of the possible contributory factors at play at the time of the dispensing incident, files with minimal missing data were purposively selected. Second, due to the large size of the database as well as the difficulty associated with manually identifying relevant cases and extracting the necessary data, purposive sampling was considered to be most feasible sampling approach. Finally, due to the exploratory nature of the study, purposive sampling was considered suitable to meet the study aims.

4.5.4.2 Inclusion criteria

In order to mitigate the potential biases and confounders associated with purposive sampling, in particular missing data within the IRFs, a pre-specified inclusion criteria was developed. This ensured a more comprehensive overview of the demographic and potential contributory factors at play at the time of the dispensing error.

Inclusion criteria

- IRFs containing both the Incident Report as well as the Environment Questionnaire
- Errors taking place in community pharmacy
- Errors arising during the dispensing process
- No more than three data elements missing
- Either one of the monthly prescription volume dispensed or daily prescription volume dispensed should be known
- Either one of the number of hours worked on the day of the dispensing error or the number of hours worked during the seven days prior to the error must be known
- The type of error must be known

The exclusion criteria were as follows:

- Prescriptions dispensed in a setting other than community pharmacy, e.g. hospital, prison or centralised hub dispensing.
- Errors associated with OTC supply of medicines.
- Incidents related to professional attitudes and behaviour

4.5.4.3 Definitions

The degree of harm caused to the patient and the time at which the error took place underwent categorisation to aid meaningful data analysis.

4.5.4.3.1 Degree of harm

The IRF contains a description of the degree of harm caused to the patient based on an assessment made by the pharmacist. Based on the information provided, the researcher made an interpretation of the information and categorised the degree of harm caused to the patient according to the NPSA's definitions of levels of harm (National Patient Safety Agency, 2011). These are described in table 8 below:

Table 8 Categories of degree of harm (National Patient Safety Agency, 2011)

Degree of Harm	Definition
No harm	A patient safety incident that had the potential to cause but was prevented and resulted in no harm.
Minor harm	Any patient safety incident that required extra observation or minor treatment and caused minimal harm to the patient.
Moderate harm	Any patient safety incident that resulted in a moderate increase in treatment and caused significant but not permanent harm to the patient.
Significant harm	Any patient safety incident that resulted in permanent harm to the patient
Death	Any patient safety incident that directly resulted in the death of the patient.

4.5.4.3.2 Time of day

The time variable was categorised in two different ways to facilitate the identification of trends and patterns in the data. Firstly, the time was categorised into the parts of day such as morning, afternoon etc. and then into each hour (see Table 9). This was done to identify whether dispensing errors were more likely to be associated with a particular part of the day, i.e. morning, afternoon or night, or with a particular hour of the day.

Table 9 Time categories for parts of the day

Time of day of the dispensing error	Definition
Morning	0501-1200
Afternoon	1201-1700
Evening	1701-2100
Night	2101-0500

4.5.4.4 Procedure

The quantitative study was carried out in two stages. First, the researcher retrieved data from the IRFs using a data abstraction instrument (see Appendix 1) and categorised the data into the following categories: the nature of the incident; the degree of harm caused; pharmacist demographics; pharmacy demographics which were sub-divided into organisational and technical factors; and, contributory factors. Continuous scale variables were manipulated to create summarised variables for the number of prescriptions dispensed per hours worked, the number of prescriptions dispensed per staff member (including the community pharmacist) present at the time of the error, and the number of minutes of rest break taken per hour worked. The degree of harm caused to the patient (see table 7) and the time at which the error took place underwent categorisation to aid meaningful data analysis. The data collected were then used to produce a summary of characteristics for each of the categories listed above.

The second stage of the study was to identify potential relationships between the variables. A summed harm score was assigned to each error using the description in the IRF of the degree of harm caused to the patient. Based on the information provided, the degree of harm caused was categorised according to the NPSA's definitions of levels of harm (see table 7). The summed harm score was calculated by summing the score assigned to the variable 'incorrectly dispensed medication ingested' (0= not ingested, 1= ingested), and the 'degree of harm caused' (1=no harm, 2=minor harm, 3=moderate harm, 4=significant harm, and 5=death) to give a final summed harm score on the scale of 1 to 6. This summed harm score was then further manipulated to assign a 'summed harm per prescriptions dispensed' (SHPP) score to each error. The final score was multiplied by 1000 to avoid the use of very small number values when computing results.

$$SHPP = \frac{\text{Medication Ingested} + \text{Degree of harm caused}}{\text{Number of prescriptions dispensed on the day of error}} \times 1000$$

Potential relationships were then examined between the SHPP variable and predictors of dispensing errors which included the number of hours worked on the day of the dispensing error, total number of hours worked during the seven days prior to the dispensing error, total number of staff present at the time of the dispensing error, ratio of trained to untrained staff present at the time of the dispensing error and the number of minutes of rest break taken per hour worked. Potential relationships between the final accuracy check variable and the gender of the pharmacist, employment status, location, layout of the dispensary, time of day, low staff levels, busier than normal/high workload, fatigue/no rest breaks, and self-checking variables were also examined.

4.5.4.5 Analysis

Descriptive statistics and frequencies were obtained and categorical data analysis was performed using IBM SPSS v22 for Windows (SPSS Inc., Chicago). Bivariate correlation and cross-tabular analyses of association between variables were undertaken. The statistical test used to assign the level of significance of association between the variables was the Chi square test. The a priori level of significance was set at a p value below 0.05.

4.5.4.6 Null Hypotheses

The following null hypotheses were tested in the quantitative phase of this study:

H1₀: The bivariate correlation analysis will reveal no statistical association between:

1. SHPP and the number of hours worked on the day of the error
2. SHPP and the number of hours worked 7 days prior to the error
3. SHPP and the number of prescriptions dispensed per month
4. SHPP and the total number of dispensary support staff employed
5. SHPP and the total number of staff present at the time of the error
6. SHPP and the number of trained staff present at the time of the error
7. SHPP and the number of untrained staff present at the time of the error
8. SHPP and rest breaks taken (mins)
9. SHPP and rest breaks taken per hours worked (mins)

H2₀: The cross-tabular analysis will reveal no statistical association between:

1. Final accuracy check and gender
2. Final accuracy check and employment status
3. Final accuracy check and pharmacy location
4. Final accuracy check and the time of day
5. Final accuracy check and the prescription volume of the day of the error
6. Final accuracy check and insufficient staff
7. Final accuracy check and busier than normal/high workload
8. Final accuracy check and fatigue/no rest breaks
9. Final accuracy check and layout of the pharmacy
10. Final accuracy check and self-checking

4.5.5 The qualitative study

For stage two, a qualitative approach was taken to analyse the detailed description of the dispensing error incidents provided by pharmacists in the IRFs.

4.5.5.1 Sampling

A purposive sample of IRFs was selected to conduct a qualitative analysis on the textual description of the dispensing errors provided by the pharmacists in the IRFs. Since the aim in the qualitative stage of this study was to achieve an in-depth understanding of the phenomena under investigation, sampling of IRFs did not seek to achieve generalisability or statistical representation.

Rather, the IRFs that contained a well-informed and comprehensive detail of the events, circumstances and contributory factors were deliberately selected to yield rich, detailed and meaningful data on the occurrence of dispensing errors in community pharmacy. The rigour of a qualitative research sample is determined by its ability to represent particular features or groups within the sample population (Ritchie et al., 2013). This was ensured by sampling IRFs of dispensing errors arising across all the community pharmacy settings to enable a representation of dispensing error occurrence in all community pharmacy settings. In qualitative research, sample size

is determined by data saturation rather than statistical power analysis (Etikan et al., 2016, Ritchie et al., 2013). In order to obtain a comprehensive understanding of the occurrence of dispensing errors in community pharmacy, IRFs were sampled until no new substantive information was acquired, i.e. to a point of data saturation.

4.5.5.2 Inclusion criteria

The same inclusion criteria as that of the quantitative study was used with slight amendments. For the qualitative study, there was no requirement for both parts of the IRFs since the description of the error was contained within the incident report and not the Environment Questionnaire. Additional criteria were as follows:

- A detailed description of the events or circumstances that took place during the build up to the dispensing error.
- A description of the pharmacists' assessment of the factors that contributed to the dispensing error.

4.5.5.3 Procedure

IRFs were retrieved from the database and demographic data of the sample was collected on a data collection form. The description of the dispensing error incident contained within the IRFs was transcribed verbatim into Microsoft Word 2013. To ensure accuracy, each transcript of the IRF was double checked to identify any errors that arose through the transcription process. A majority of the IRFs in the database were handwritten. In cases where poor handwriting hindered legibility of a large part or most of the IRFs, these were excluded from the study. However, in other cases, where difficulties arose in reading a word or a phrase in the IRF, a second opinion was sought. Only if the word or phrase made sense within the context of the passage, were the IRFs included in the study. A written passage of the event contained within supplementary documents attached to the IRFs for example, company incident report forms, were ignored as the potential repetition of the events would confound the results in the study.

The transcribed IRFs were imported into NVivo 11 Pro and subjected to qualitative analysis. NVivo 11 Pro is developed by the world's largest qualitative research software developer - QSR international (Melbourne, Australia) (Wong, 2008). The data yielded in qualitative research is commonly unstructured text-based data (Wong, 2008). Unlike quantitative data analysis, which tends to be a technical process, qualitative data analysis is a dynamic, intuitive and creative process of inductive reasoning and theorising (Wong, 2008). NVivo 11 Pro can improve the management, reduction and storage of qualitative data as well as assist in qualitative data analysis by enhancing the coding, modelling and retrieval of qualitative data.

4.5.5.4 Analysis

Since the purpose of this study was to obtain context based data about the possible explanation and predictors for the occurrence of dispensing errors, the detailed written account of the dispensing error incident provided in the IRF was processed using conceptual content analysis to identify key themes and ascertain the contextual meanings embodied within the responses.

Conceptual content analysis of text data is '*to analyse the conceptual structure that a text invokes in particular readers*' (Krippendorff, 2004). This involves breaking large pieces of text into smaller units of analysis (Krippendorff, 2004). The distillation of words into smaller categories enables a condensed and a broad picture of the phenomena to be achieved (Elo and Kyngäs, 2008).

The data were examined by coding the responses using an inductive approach. Due to the exploratory nature of the study, an inductive approach was considered most suitable to enable themes to emerge from the repeated review and classification of raw data. A very basic coding framework was initially developed based on the knowledge of potential explanations and contributory factors of dispensing errors gained from the literature review and the quantitative study. The IRFs were then read and re-read to immerse into the data to gain a familiarisation of the content. In order to ensure intra-rater reliability, coded IRFs were then re-coded after a lapse of time (in most cases after a day or two) to compare and identify any inconsistencies in coding

the IRFs. To ensure inter-rater reliability, a selection of three IRFs were coded by another research student and coding was compared to identify the degree of agreement between different coders. Testing for inter-rater reliability did not reveal any significant differences in the coding and categories identified; where minor differences existed a consensus was agreed between the researchers. The codes were then grouped together to form categories and quantified to reflect the particular emerging theme (Krippendorff, 2004).

4.6 Pilot study

Prior to undertaking the primary study, a pilot study was conducted on both the quantitative and qualitative parts of the study to determine the feasibility of the proposed methods and materials and to reveal any deficiencies in the study design.

4.6.1 Quantitative study

For the pilot study, 62 IRFs were retrieved, representing 62 dispensing errors. The data abstraction form was used to gather data from the IRFs in a standardised and uniform manner. The main aim of the pilot study was to test the usability of the database and the ease of data extraction. The pilot study revealed minor faults in the study design. The initial inclusion criteria required that none of the data fields in the data abstraction form be missing. Working with the database revealed a great degree of variation in two aspects of the IRFs. First, the amount of missing data in the IRFs varied considerably. Second, it was very difficult to identify which data fields were likely to have data missing. Therefore, in an attempt to increase the sample size whilst retaining rigour, the initial limitation in the inclusion criteria pertaining to 'no missing data' was replaced with 'no more than 3 missing data fields'. Otherwise, the pilot study confirmed the study design and materials to be appropriate. Thus the 62 cases of dispensing errors were subsequently included in the primary study.

4.6.2 Qualitative study

A pilot study was conducted on a purposive sample of five dispensing error reports. A sample of five reports was considered sufficient to evaluate the feasibility of the methods and materials. The pilot study did not reveal any faults in the study design. This allowed the five dispensing error reports used in the pilot study to be included in the primary study.

4.7 Results

4.7.1 Quantitative Study

4.7.1.1 Nature of the dispensing error

In total, 706 of around 4000 files detailing 706 dispensing errors were retrieved from the database. Of the total 22,592 data fields, 1,355 contained missing data (6%). Statistical analysis was performed on the non-missing data. The IRFs dated from June 2006 to December 2013. The incidents most often involved the selection of an incorrect item (42.14%, n=299/706) incorrect strength (24.5%, n=173/706), supplying the medication to an incorrect patient (7.9%, n=56/706) and incorrect quantity (7.1%, n=50/706). The final accuracy check was performed prior to supplying the medication in almost three quarters (73.8%, n=478/648) of the cases. Variations were seen in the time of day that the dispensing errors took place in, with most of the errors occurring during the afternoon (49.6%, n=287/579), followed by the morning (35.8%, n=207/579) and the evening (13.6%, n=79/579). When the time was analysed by the hour, two peaks were apparent: one at 1001-1100 hours (14.0%, n=75/534) and one at 1601-1700 hours (12.7%, n=68/534). Analysis of months in which the errors took place in revealed a higher frequency of errors (47.8.0%, n=336/703) between June to October, with June (10.0%, n=70/703) being the month with the greatest number of errors. However, a dip was seen in September (8.4%, n=59/706). Table 10-12 show a summary of the results for the nature of the incident.

Table 10 Frequencies of dispensing error types

Error type	Percentage (number)
Wrong item	42.4 (299)
Wrong strength	24.5 (173)
Wrong quantity	7.1 (50)
Wrong patient	7.9 (56)
Labelling/dosage error	8.5 (60)
Out of Date medication supplied	3.3 (23)
Out of date Rx/post-dated Rx	1.4 (10)
Wrong formulation/brand	1.4 (10)
Prescribing error	0.6 (4)
Omission	0.7 (5)
Label swap	1.0 (7)
Reconstitution error	0.1 (1)
Procedure/protocol error	0.8 (6)
Other	0.2 (2)
Total	100 (706)

Table 11 Frequencies of dispensing errors according to time in hours

Time 2	Percentage (number)
0701-0800	0.2 (1)
0801-0900	2.4 (13)
0901-1000	8.8 (47)
1001-1100	14.0 (75)
1101-1200	9.6 (51)
1201-1300	10.3 (55)
1301-1400	12.7 (68)
1401-1500	7.5 (40)
1501-1600	3.7 (20)
1601-1700	1.2 (3)
1701-1800	1.5 (8)
1801-1900	0.9 (5)
1901-2000	100 (706)

Table 12 Frequencies of how pharmacists became aware of the dispensing error

How pharmacist became aware of error	Percentage (number)
Informed by employer/contractor/staff	44.6 (314)
Informed by the patient or their representative	30.1 (212)
Discovered it by yourself	13.2 (93)
Informed by the patient's doctor	5.7 (40)
Informed by a third party e.g. solicitor, GPhC inspector	5.3 (37)
Other	0.9 (7)
Informed by the police	0.1 (1)
Total	100 (704)

Figure 5 A bar chart showing the types of dispensing errors

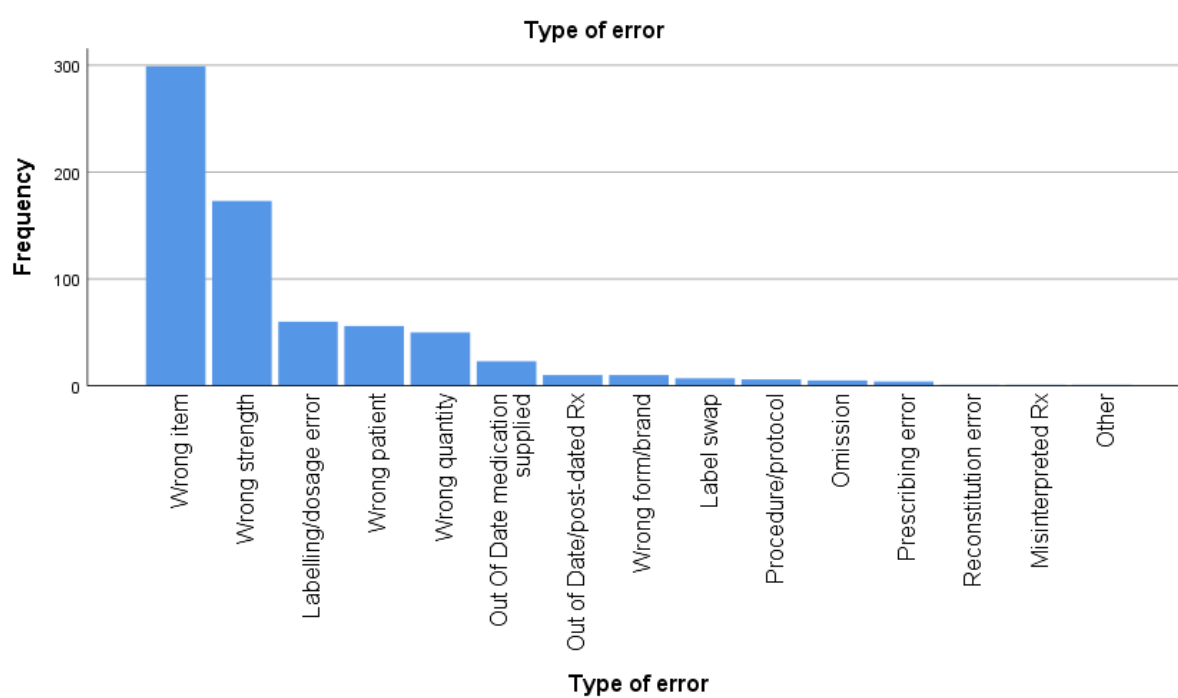


Figure 6 A bar chart the part of day during which the dispensing errors took place

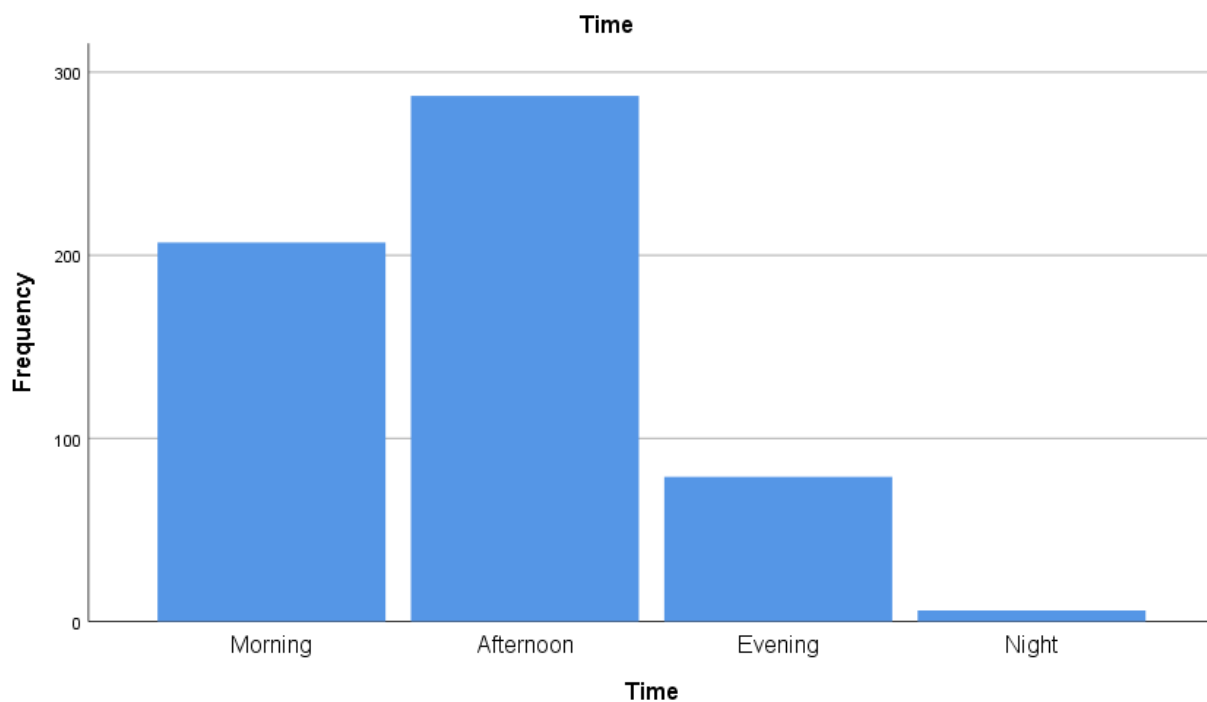
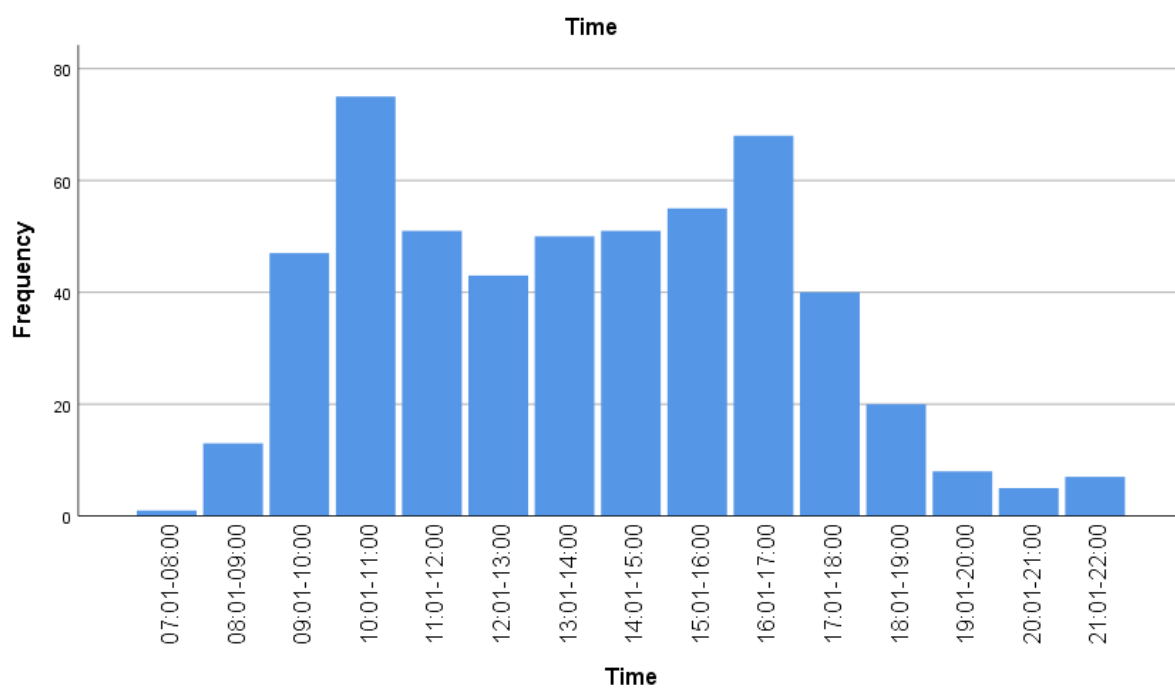


Figure 7 A bar chart showing the times of day during which the dispensing errors took place



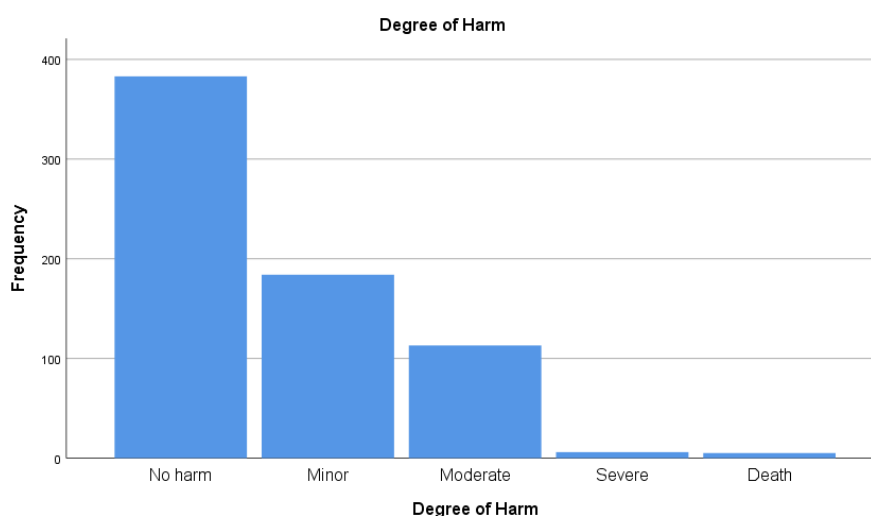
4.7.1.2 Degree of harm caused to the patient

In three quarters (74.5%, n=514/690) of the incidents, at least one dose of the incorrectly dispensed medication was ingested by the recipient of the medication prior to identification of the incident. The researcher's interpretation of the information provided in the IRF revealed that fifty five percent (n=383/691) of patients suffered no harm as a result of the dispensing error, twenty seven percent (n=184/691) suffered minor harm, sixteen percent (n=113/691) suffered moderate harm and almost two percent (n=11/691) suffered significant harm (n=6/691) or death (n=5/691). Fifteen IRFs did not specify the degree of harm caused to the patient (see Table 13).

Table 13 Summary of results for the outcome and degree of harm caused

Was the incorrectly dispensed medication ingested/applied? Percentage (number) n=690	Degree of harm caused to the patient Percentage (number) n=691
Yes 74.5 (514)	No harm 55.4 (383)
No 25.5 (176)	Minor harm 26.6 (184)
Total 100 (690)	Moderate harm 16.4 (113)
	Significant harm 0.9 (6)
	Death 0.7 (5)
	Total 100 (691)

Figure 8 A bar chart showing the degree of harm arising from the dispensing errors



4.7.1.3 Pharmacist demographics

Analysis of the pharmacist demographics revealed that 54.7% (n=386/706) of incidents involved a male pharmacist in comparison to 45.3% (n=320/706) incidents involving a female pharmacist (Figure 9). The majority (76.9%, n=539/701) of pharmacists worked regularly at the premises where the error took place: 41.0% (n=287/701) worked as a regular³ locum and 39.7% (n=278/700) worked as an employee⁴ (Figure 10). Almost three quarters (71.4%, n=503/704) of the pharmacists worked at the premises where the error took place during all the functioning hours of the day, with the mean number of hours worked on the day of the error being 9.03 (± 1.91 SD). The results also revealed that over a quarter (26.7%, n=187/701) of the pharmacists did not take a rest break throughout the hours that they worked on the day of the dispensing error. It is of note that almost half (46.8%, n=325/694) of the pharmacists reported that there was an expectation that they do not take a rest break. When the 'total time taken for rest breaks' and the 'total number of hours worked on the day of error' variables were combined to create a single summarised variable, the mean of the 'total rest break taken (mins) per hour worked' (n=669) was found to be 3 (± 2.7 mins SD) mins.

³ Regular was defined as having worked at the premises previously at least ten times or more.

⁴ Twenty seven pharmacists were newly employed and had worked less than 10 times at the premises where the error took place.

Figure 9 A bar chart showing the gender of pharmacists

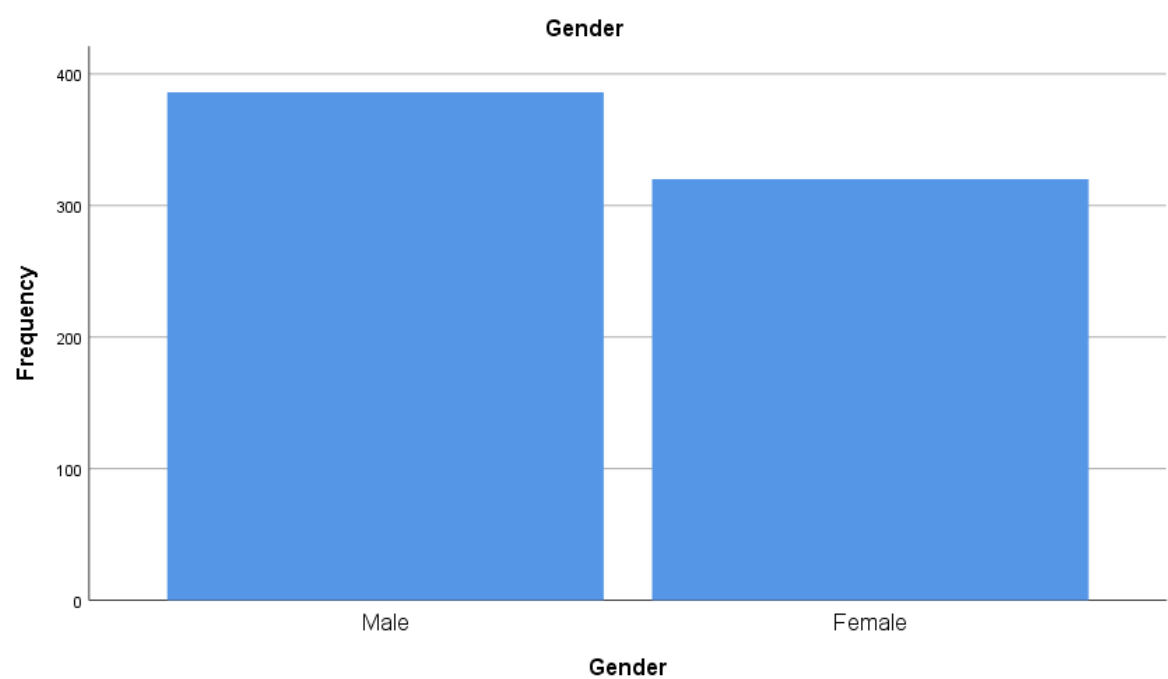
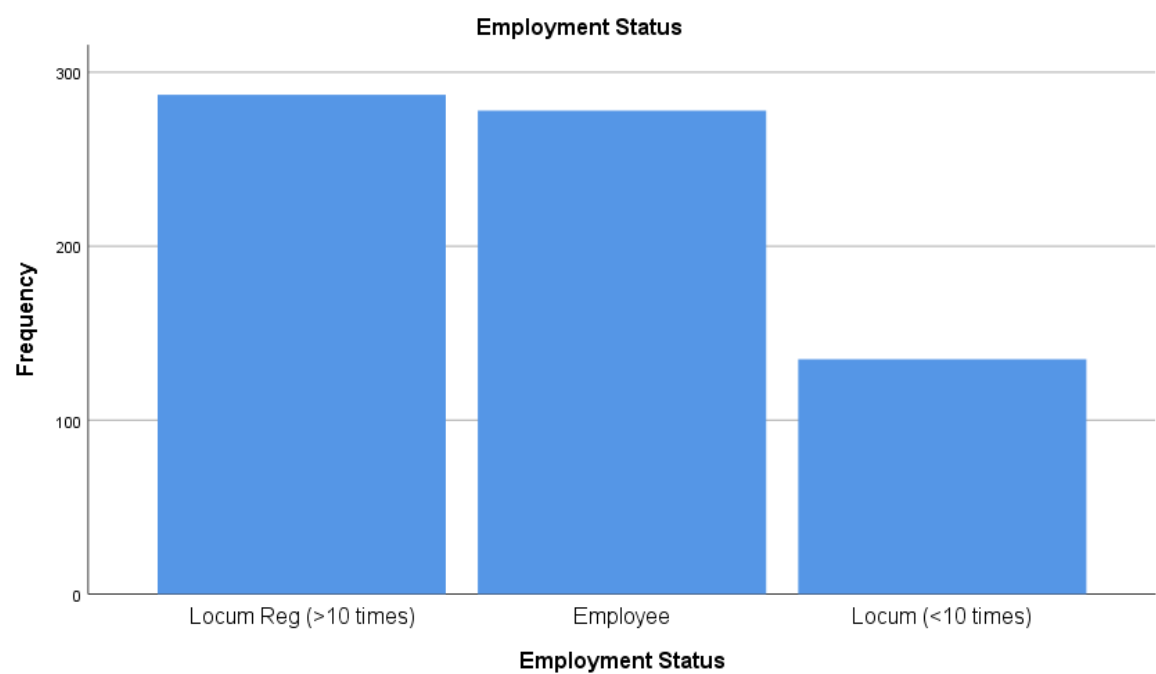


Figure 10 A bar chart showing the employment status of pharmacists on the day of the dispensing error



4.7.1.4 Pharmacy organisational and technical characteristics

Pharmacy organisational characteristics are shown in Table 14. Pharmacy technical factors included type of pharmacy, computer system used and the layout of medicines in the dispensary. The main pharmacy setting that the dispensing errors took place in were local community (suburban) pharmacies (36.7%, n=257/701), followed by high street pharmacies (25.0%, n=175/701), supermarket pharmacies (19.3%, n=135/701), and health centre pharmacies (9.1%, n=64/701). Over a third of the pharmacies (37.9%, n=267/704) had all goods laid out in alphabetical order by their generic name and almost a quarter (23.9%, n=168/704) had all generics and proprietary goods together and in alphabetical order, whilst a tenth (10.2%, n=72/704) had generics and proprietary goods separate and in alphabetical order. Nexphase (27.4%, n=190/694) was the most common pharmacy computer system used followed by Proscript (22.9%, n=159/694) and Pharmacy Manager (20.5%, n=142/694). The majority of pharmacists (93.9%, n=661/704) reported that they were familiar with the computer dispensing system used to dispense the medication. An analysis of the organisational factors revealed the mean number of prescriptions dispensed on the day of the dispensing error was 314 (± 198 SD), with the mean number of total staff (excluding the pharmacist) present at the time of the error being 2.04 (± 1.41 SD). Of these, the ratio of trained (1.53 ± 1.15 SD) to untrained (0.52 ± 0.84 SD) staff present at the time of the error was found to be 3 to 1.

Figure 11 A bar chart showing the type of pharmacy where dispensing errors took place

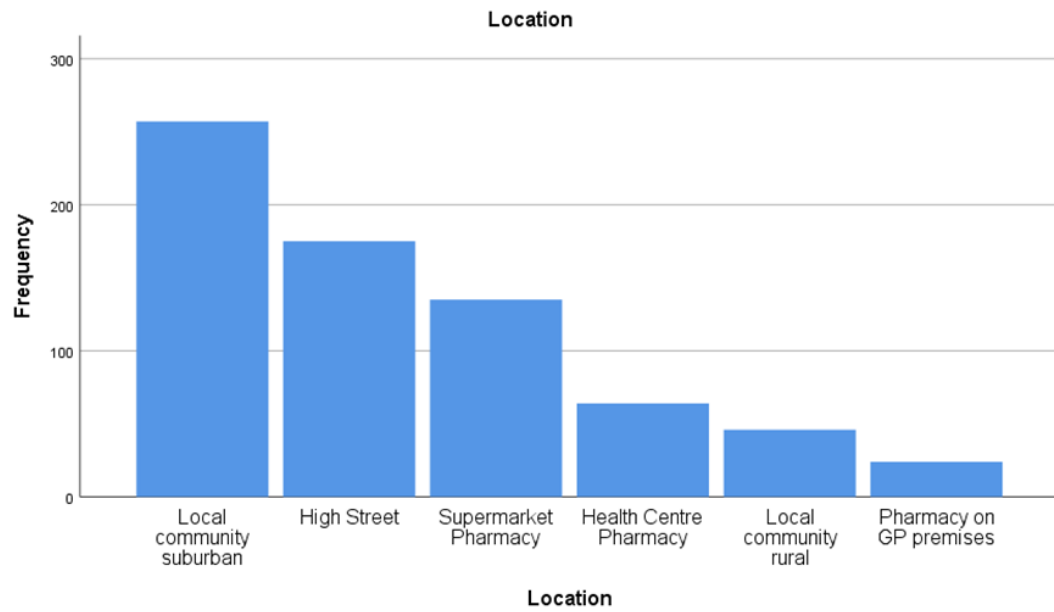


Figure 12 A bar chart showing the computer system used on the day of the dispensing error

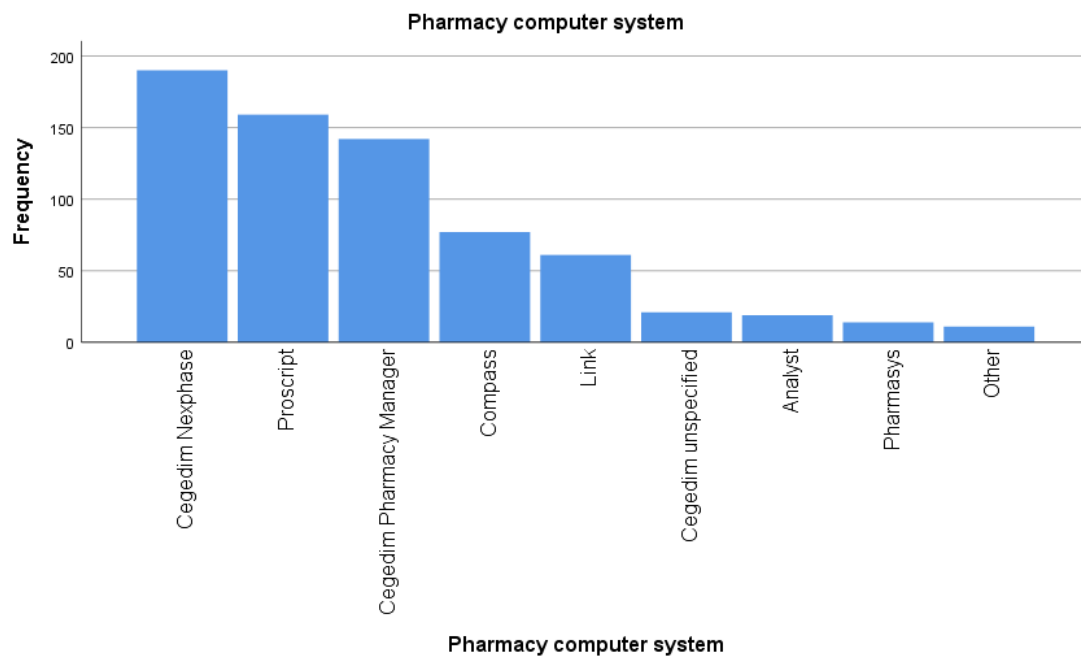


Table 14 Summary of pharmacy organisational characteristics

Organisational factors	Mean (\pm SD)	Median	Range	Q1-Q3
Monthly prescription volume (n=671)	7303 (\pm 3964)	6500	900-30000	4700-9000
Prescription volume on day of error (n=632)	314 (\pm 198)	274	9-1539	181-400
Total full time dispensary staff employed (n=669)	2.40 (\pm 1.41)	2.00	0-11	1.5-3.00
Total number of staff present at the time of the dispensing error (n=691)	2.03 (\pm 1.34)	2.00	0-10	1.00-3.00
Number of trained staff present at the time of the dispensing error (n=632)	1.53 (\pm 1.14)	1.00	0-6	1.00-2.00
Number of untrained staff present at the time of the dispensing error (n=690)	0.51 (\pm 0.80)	0	0-7	0.00-1.00

4.7.1.5 Contributory factors

Table 15 shows the contributory factors reported by pharmacists. Insufficient staff (47.0%, n=332/706), the pharmacy being busier than normal or high workload (41.5%, n=293/706), fatigue/no rest breaks (41.5%, n=293/706), similar packaging (37.5%, n=265/706), layout/drugs placed next to each other (30.7%, n=217/706), small/cluttered/unorganised dispensary (20.5%, n=145/706) and untrained staff (15.4%, n=109/706) present at the time of the dispensing error were identified as the key contributory factors to the occurrence of the dispensing error. Other contributory factors identified included, self-checking of prescriptions (15.0%, n=106/706), interruptions/distractions (12.9%, n=91/706) and pressure due to waiting patients/delivery driver (12.9%, n=91/706).

Table 15 Contributory factors of the dispensing errors

Contributory Factor	Percentage (number) n=706
Insufficient staff	47.0 (332)
Busier than normal/high workload/lots of queries	41.5 (293)
Fatigue/no rest breaks	41.5 (293)
Similar packaging	37.5 (265)
Layout/close proximity of drugs	30.7 (217)
Small/crowded/cluttered/unorganised dispensary	20.5 (145)
Untrained/new/inexperienced staff	15.4 (109)
Self-checking	15.0 (106)
Distractions and interruptions	12.9 (91)
Waiting patients/delivery driver	12.9 (91)
Work pressure and stress	6.7 (47)
Similar drug names	5.0 (35)
Pharmacy renovation/computer system change	4.2 (30)
Lack of privacy of dispensary area	3.3 (23)
Human error/misread the prescription/calculation error	1.7 (12)
Noise/lighting	1.7 (12)

4.7.1.6 Summary of continuous combined variables

Table 16 shows a summary of the continuous combined variables. For prescriptions dispensed per hour, the number of hours worked on the day of the error and the number of prescriptions dispensed on the day of the error were combined to form a new variable for all pharmacists who indicated that they had worked during all the operational hours of the pharmacy. The mean number of prescriptions dispensed per hour was found to be 33 (± 18).

Similarly the number of prescriptions dispensed per staff member on the day of the error was calculated for each error, giving a mean of 110 (± 62). The summed harm score gave a mean of 2.91 (± 0.75) and the SHPP gave a mean of 14.8 (± 18). The amount of time pharmacists spent during a rest break was used to create the 'rest break taken per hour worked variable', giving a mean of 3.00 (± 2.67) mins.

Table 16 Summary of combined continuous variables

	Mean (\pm SD)	Median	Range	Q1-Q3
Prescriptions dispensed per hour	33 (\pm 18)	31	1-100	20-44
Prescriptions per dispensary staff member	110 (\pm 62)	98	1-600	69-133
Summed harm score	2.91 (\pm 0.75)	3	2-6	2-3
Summed harm per prescription dispensed	14.8 (\pm 18)	10	0.4-200	6.67-15.90
Rest break taken per hour worked (mins)	3.00 (\pm 2.67)	2.86	0.00-12.00	0.00-5.00

4.7.1.7 Bivariate correlation analysis

Results of the bivariate correlation analyses (see Table 17) revealed a significant association between 8 of the 9 variables tested against the SHPP variable, therefore rejecting the null hypothesis for eight of those variable. A statistically significant negative association was observed between the 'number of hours worked on the day of error' and SHPP score ($r=-0.245$, $p<0.000$) suggesting that working fewer number of hours on the day of the error are associated with an increased SHPP score. Similarly a negative association was observed between the SHPP and the monthly prescription volume ($r=-0.305$, $p<0.000$), suggesting the SHPP is lower in higher volume pharmacies. A statistically significant negative correlation was also observed between all four of the dispensary support staff variables and SHPP including: total number of dispensary support staff employed ($r=-0.265$, $p<0.000$), total number of staff present at the time of the error ($r = -0.346$, $p<0.000$) and the total number of trained staff present at the time of the error ($r = -0.297$, $p<0.000$). Interestingly, a relatively weaker but statistically significant correlation was also observed between the total number of untrained staff and the SHPP ($r=-0.153$, $p<0.000$), suggesting that the SHPP decreased as the number of untrained support staff increased. The results suggest that the risk associated per prescription decreases as the number of total support staff increases regardless of the level of training. A negative correlation

was also observed between SHPP and the two rest break variables: the rest break taken (mins) ($r=-0.109$, $p<0.008$) and the rest break per hour worked (mins) ($r=-0.101$, $p<0.016$)

Table 17 Summary of bivariate correlation analyses of a range of factors against SHPP

Bivariate correlation analyses	Pearson correlation	Number of cases	P value
SHPP v Number of hours worked on the day of the error	-0.245	607	0.000
SHPP v Number of hours worked 7 days prior to the error	-0.030	578	0.475
SHPP v The number of prescriptions dispensed per month	-0.305	579	0.000
SHPP v Total number of dispensary support staff employed	-0.265	578	0.000
SHPP v Total number of staff present at the time of the error	-0.346	596	0.000
SHPP v Number of trained staff present at the time of the error	-0.297	593	0.000
SHPP v Number of untrained staff present at the time of the error	-0.153	595	0.000
SHPP v Rest breaks taken (mins)	-0.109	580	0.008
SHPP v Rest breaks taken per hours worked (mins)	-0.101	577	0.016

Figure 13 Monthly prescription volume vs SHPP

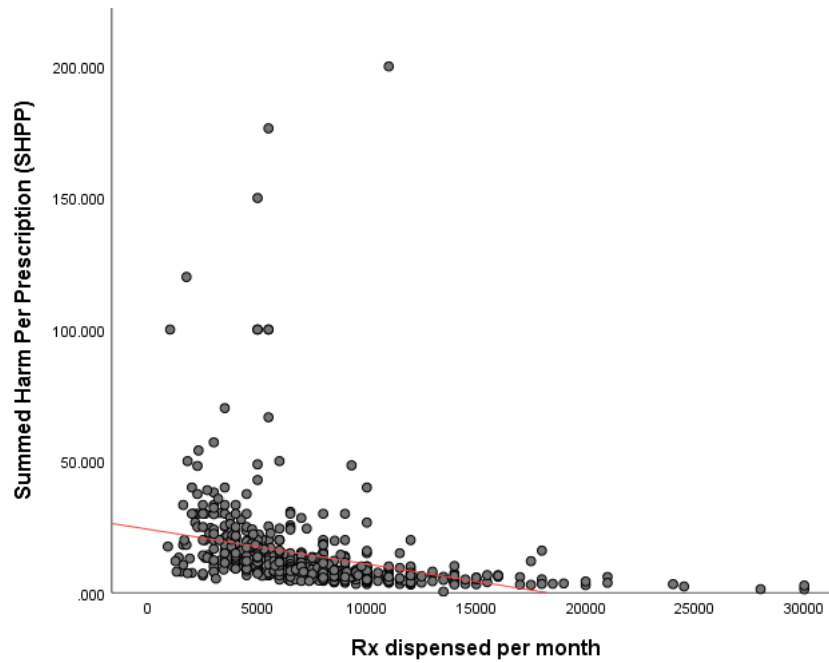


Figure 14 Total number of hours worked on the day of error vs SHPP

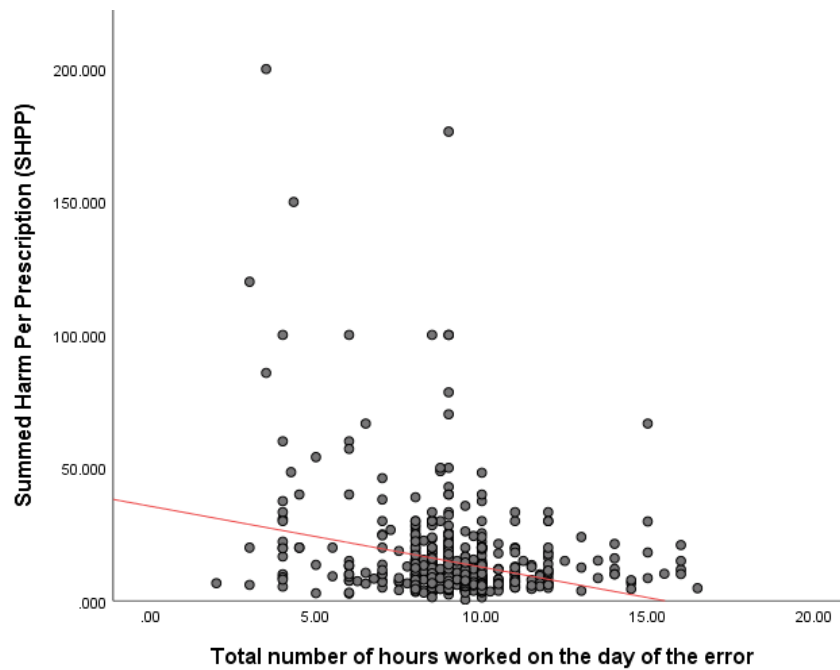


Figure 15 Total number of dispensary support staff present at the time of error vs SHPP

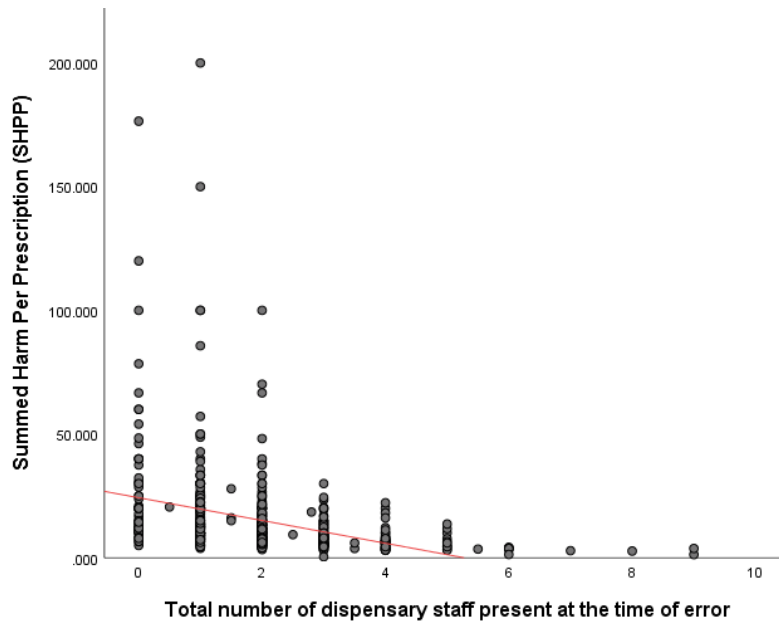
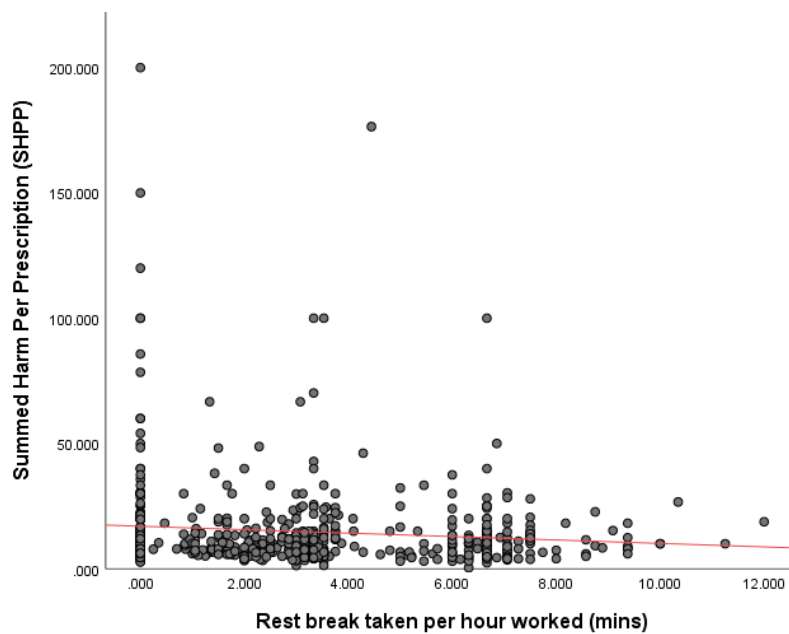


Figure 16 Rest break taken per hour worked (mins) vs SHPP



4.7.1.8 Cross-tabular analysis

Cross-tabular analyses of the variables tested against the final accuracy check variable are shown in table 16. A significant association was observed between 6 of the 10 variables tested, therefore rejecting the null hypothesis for these six variables. Whilst the gender of the pharmacist produced an association above the a priori level of statistical significance set at 0.05, the results appeared to trend towards significance ($p < 0.064$). However, the employment status of the pharmacist did not produce a statistically significant association ($p < 0.657$) between the final accuracy check variable. The results suggest that particular types of pharmacy locations ($p < 0.038$) may be associated with a reduced likelihood of the pharmacist performing a final accuracy check. However, the layout and arrangement of the medicines appeared to have no association with the final accuracy check variable. Cross-tabulating the final accuracy check variable with the time variable produced an association very close to the margin of statistical significance ($p < 0.052$). Of the contributory factors tested, a significant association was also observed between the insufficient staff variable ($p < 0.019$), the busier than normal/high workload variable (0.005) and fatigue/no rest breaks taken. When the prescription volume on the day of the dispensing error was dichotomised using a mean split to create categorical data, a statistically significant association ($p < 0.005$) was observed with the final accuracy check variable. These results, in combination with the bivariate correlation analyses, suggest that insufficient staffing levels, increased levels of busyness/high workload, and fatigue/lack of rest breaks may adversely influence the occurrence of dispensing errors.

Table 18 Number (expected count) of pharmacists performing the final accuracy check by a range of factors

Variable	Variable categories	Final accuracy check performed		Number of cases	P value
		Yes	No		
Gender	Male	270 (260)	208 (218)	648	0.064
	Female	82 (93)	88 (78)		
Employment status	Locum < 10 times	92 (89)	29 (32)	642	0.657
	Locum regular >10 times	191 (196)	75 (71)		
	Employee	189 (188)	66 (68)		
Pharmacy location	High Street	115 (120)	48 (43)	643	0.038
	Supermarket	80 (91)	43 (32)		
	Local com sub	175 (171)	57 (61)		
	Health Centre Pharmacy	50 (44)	10 (16)		
	Local com rur	35 (31)	7 (11)		
	GP premises pharmacy	19 (17)	4 (6)		
Time of day	Morning	147 (143)	45 (49)	526	0.052
	Afternoon	199 (195)	62 (67)		
	Evening	46 (54)	27 (19)		
Layout	Yes	141 (147)	337 (331)	648	0.262
	No	58 (52)	112 (118)		
Insufficient staff	Yes	210 (221)	90 (79)	648	0.043
	No	268 (257)	80 (91)		
Busier than normal/high workload	Yes	186 (198)	83 (71)	648	0.024
	No	292 (280)	87 (99)		
Prescription volume on day or error	Low	241 (255)	98 (84)	575	0.005
	High	192 (178)	44 (58)		
Self-checking	Yes	62 (75)	416 (403)	648	0.001
	No	40 (27)	130 (143)		
Fatigue/no rest breaks	Yes	185 (198)	83 (71)	648	0.024
	No	292 (280)	87 (99)		

4.7.2 Qualitative study

4.7.2.1 Sample characteristics

A sample of seventy seven IRFs were retrieved from the database for qualitative content analysis. Table 19 shows a summary of the sample characteristics. The sample consisted of 57% (n=44/77) female pharmacists and 43% (n=33/77) males. In terms of employment status, 27% (n=21/77) of the sample worked on an employed basis on the day of the dispensing error, whereas 73% (n=56/77) worked as a locum. Almost half (n=37/77) of the incidents in the sample involved a wrong item error, followed by wrong strength (18%, n=14/77) and wrong quantity (18%, n=14/77), and labelling/dosage error (9%, n=7/77). The errors most often took place in a local community pharmacy (suburban) (40%, n=31/77) followed by supermarket pharmacy (30%, n=23/77) and high street pharmacies (16%, n=12/77). The volume of prescriptions dispensed on the day of the error ranged from 50 to 700 with a mean of 259, whilst nine stated being busier than normal without specifying the prescription numbers for the day. However, in thirteen IRFs this information was missing. The average number of hours worked on the day of the error was 8.75 hours with a range of 3 to 14.5 hours. The number of hours worked on the day of the error was unknown in thirteen IRFs. Almost half (49%, n=38/77) of the incidents took place in the afternoon, followed by morning (19%, n=13/77) and evening (17%, n=13/77). The time of the error was unknown in 11 IRFs. A final check was performed on the prescribed item in just over half of the incidents (52%, n=40/77), of which 10% (n=8/77) were incidents where the pharmacist dispensing the medicine checked his/her own work (self-check). However, around a third of the incidents were those where a final check on the dispensed medicines was not performed. This piece of information was missing in 16% (n=12/77) of the IRFs.

Table 19 Sample characteristics

Pharmacist ID	Gender	Employment status	Error type	Location	Rx vol/day	Work hours/day	Rest break	Time	Final check
CP01	Male	Locum	Wrong item	Local community suburban	300	14.5	1hr 15min	Morning	No
CP02	Male	Employee	Wrong item	Supermarket	164	8	30mins	Afternoon	Yes
CP03	Female	Locum	Wrong item	High St.	65	7	20mins	Afternoon	Yes
CP04	Male	Locum	Wrong quantity	Supermarket	105	7	10mins	Evening	No
CP05	Female	Locum	Wrong quantity	Local community suburban	150	4	No rest break	Afternoon	Yes
CP06	Female	Locum	Wrong item	Local community suburban	Unknown	12.5	Unknown	Unknown	Unknown
CP07	Male	Locum	Wrong item	Local community suburban	250	9	Unknown	Afternoon	No
CP08	Female	Locum	Wrong item	Local community suburban	Unknown	Unknown	Unknown	Morning	Unknown
CP09	Female	Employee	Wrong item	Supermarket	Unknown	Unknown	Unknown	Unknown	Unknown
CP10	Female	Locum	Wrong strength	Local community suburban	Busier than normal	Unknown	Unknown	Afternoon	No
CP11	Male	Locum	Wrong strength	Supermarket	Unknown	9	No rest break	Afternoon	Not sure
CP12	Female	Locum	Wrong item	Local community suburban	300	9.5	30mins	Afternoon	No
CP13	Female	Locum	Wrong strength	High St.	Unknown	10	No rest break	Afternoon	No
CP14	Male	Locum	Wrong form	Supermarket	394	13	Unknown	Afternoon	No
CP15	Female	Locum	Wrong item	High St.	Busier than normal	8.5	No rest break	Morning	Self-check
CP16	Male	Locum	Wrong item	Local community suburban	250	9.5	No rest breaks	Unknown	Yes
CP17	Male	Locum	Wrong quantity	Local community suburban	Busier than normal	9	30mins	Afternoon	Self-check

CP18	Female	Employee	Wrong item	Local community suburban	Unknown	9.5	20mins	Morning	Self-check
CP19	Male	Locum	Wrong quantity	Health Centre Pharmacy	529	9.75	1 hr	Afternoon	Self-check
CP20	Male	Locum	Wrong quantity	High St.	150	7	No rest break	Unknown	Self-check
CP21	Female	Locum	Prescribing error	Health Centre Pharmacy	Unknown	8	10mins	Unknown	Yes
CP22	Female	Locum	Wrong form	Supermarket	Busier than normal	Unknown	Unknown	Evening	Self-check
CP23	Male	Locum	Wrong item	Local community suburban	Busier than normal	Unknown	Unknown	Afternoon	Yes
CP24	Male	Employee	Wrong item	Supermarket	141	8	No rest break	Evening	Yes
CP25	Female	Employee	Wrong item	Supermarket	Unknown	9	No rest break	Afternoon	No
CP26	Female	Locum	Wrong item	Local community suburban	218	9	No rest break	Afternoon	No
CP27	Male	Locum	Wrong strength	Supermarket	273	Unknown	30mins	Afternoon	No
CP28	Male	Locum	Wrong quantity	High St.	Busier than normal	Unknown	Unknown	Unknown	Unknown
CP29	Male	Locum	Wrong item	Health Centre Pharmacy	Unknown	9.5	30mins	Unknown	Unknown
CP30	Male	Locum	Wrong item	Health Centre Pharmacy	700	9.5	20mins	Evening	Yes
CP31	Female	Locum	Wrong strength	Local community suburban	500	9	No rest break	Afternoon	No
CP32	Female	Locum	Labelling/dosage	Local community suburban	Busier than normal	8	15mins	Afternoon	No
CP33	Female	Locum	Wrong strength	High St.	Unknown	8	30mins	Morning	No
CP34	Female	Locum	Wrong strength	Local community suburban	99	8.5	1hr	Afternoon	Yes
CP35	Female	Employee	Wrong quantity	Supermarket	173	9.5	15mins	Morning	Yes
CP36	Male	Locum	Wrong patient	Health Centre Pharmacy	Unknown	10	No rest break	Afternoon	Unknown
CP37	Male	Locum	Labelling/dosage	Supermarket	250	8	20mins	Afternoon	Yes

CP38	Female	Locum	Labelling/dosage	Supermarket	46	9	No rest break	Evening	Yes
CP39	Female	Locum	Wrong item	Local community rural	415	9	30mins	Afternoon	Yes
CP40	Female	Locum	Wrong item	Local community suburban	488	9	No rest break	Morning	Yes
CP41	Female	Locum	Wrong item	Local community suburban	Busier than normal	Unknown	Unknown	Morning	Unknown
CP42	Female	Locum	Wrong item	Local community suburban	200	Unknown	Unknown	Afternoon	Unknown
CP43	Female	Locum	Wrong strength	Supermarket	Busier than normal	Unknown	Unknown	Evening	Self-check
CP44	Male	Employee	Labelling/dosage	Supermarket	220	11	1hr 30mins	Evening	Yes
CP45	Female	Locum	Wrong quantity	Local community suburban	200	9.5	1hr 20mins	Afternoon	Yes
CP46	Male	Locum	Wrong item	Supermarket	Unknown	6	No rest break	Evening	No
CP47	Female	Employee	Wrong patient	Local community suburban	250	9.5	30mins	Afternoon	Self-check
CP48	Male	Employee	Wrong item	Local community suburban	329	9.5	1hr	Afternoon	Yes
CP49	Female	Locum	Wrong item	High St.	Unknown	6	No rest break	Unknown	No
CP50	Male	Employee	Labelling/dosage	High St.	650	8.25	45mins	Evening	Yes
CP51	Male	Locum	Wrong strength	Supermarket	100	7	No rest break	Evening	No
CP52	Female	Locum	Wrong item	Local community suburban	225	8	30mins	Afternoon	No
CP53	Male	Employee	Wrong quantity	Local community suburban	310	8.5	30mins	Afternoon	Yes
CP54	Female	Locum	Wrong item	High St.	50	10	20mins	Afternoon	Yes
CP55	Male	Locum	Wrong item	High St.	214	8.5	10mins	Afternoon	Yes
CP56	Male	Locum	Wrong item	Local community suburban	371	9	30mins	Afternoon	Yes
CP57	Male	Employee	Wrong quantity	Local community suburban	700	10	30mins	Unknown	No
CP58	Female	Employee	Wrong strength	Supermarket	83	10	30mins	Morning	Yes

CP59	Female	Locum	Wrong quantity	Local community rural	200	9	1hr	Afternoon	Unknown
CP60	Male	Locum	Wrong item	Supermarket	Busier than normal	Unknown	Unknown	Morning	Yes
CP61	Female	Locum	Wrong item	Health Centre Pharmacy	365	9	10mins	Afternoon	Yes
CP62	Female	Employee	Wrong item	Local community suburban	Unknown	Unknown	Unknown	Evening	Unknown
CP63	Female	Employee	Labelling/dosage	High St.	300	10	15mins	Unknown	Yes
CP64	Female	Employee	Wrong quantity	Supermarket	100	10	1hr	Morning	Yes
CP65	Female	Employee	Wrong item	Local community rural	175	8.5	30mins	Afternoon	No
CP66	Female	Locum	Wrong strength	Supermarket	Unknown	6	30mins	Afternoon	Unknown
CP67	Female	Locum	Wrong item	High St.	Unknown	8	1hr	Morning	No
CP68	Male	Locum	Wrong item	Local community suburban	100	10	No rest break	Morning	Yes
CP69	Male	Employee	Wrong item	Supermarket	548	9	30mins	Evening	Yes
CP70	Female	Locum	Wrong item	Local community suburban	Unknown	3	No rest break	Morning	Yes
CP71	Male	Employee	Wrong item	Local community rural	215	8	1hr	Afternoon	Yes
CP72	Male	Locum	Wrong strength	Pharmacy on GP premises	Unknown	10	1hr	Unknown	Yes
CP73	Male	Locum	Wrong quantity	Local community suburban	60	4	No rest break	Afternoon	No
CP74	Female	Employee	Labelling/dosage	Local community suburban	350	11	15mins	Morning	No
CP75	Female	Employee	Wrong strength	Supermarket	122	7	30mins	Evening	No
CP76	Female	Locum	Wrong strength	Local community suburban	Unknown	Unknown	Unknown	Afternoon	Unknown
CP77	Female	Locum	Wrong quantity	Supermarket	300	8	No rest break	Afternoon	No

4.7.2.2 Content Analysis

Three key themes emerged after the IRFs were subjected to conceptual content analysis. These, along with subthemes are shown in table 20 below.

Table 20 Thematic analysis of IRFs

Theme	Sub-themes
Contributory factors	High workload
	Staff shortages
	Inadequately trained support staff
	Pressure due to waiting patients/delivery driver
	Distractions and interruptions
	Unorganised/small/cluttered dispensary
	Lack of rest breaks
Impact of the error on pharmacist	Impact on pharmacist's practice
	Outcome for the pharmacist
Learning as a result of the error	Reactive learning
	Proactive learning

4.7.2.2.1 Contributory Factors

High workload

A high level of workload was by far the most commonly recurring theme in relation to the contributory factors of the dispensing errors - ninety nine references were made to high workload by fifty five pharmacists. The source of high workload ranged from the dispensing of medicines, answering patient's queries, overlooking and supplying OTC medicines, providing services such as the MURs, delivering the substance misuse services, answering phone calls and managing stock.

'When the error occurred, remember having a large workload to get through from the surgery, loads of large walk-in prescriptions, methadone patients to attend to, patients waiting to speak to me both in shop and on the phone, the order had to be sent and stock managed. There was a lot to do.' (CP42)

However what pharmacists attributed most to the occurrence of dispensing errors was not just a high workload, rather it was a higher than average workload for that particular pharmacy.

'It was one of the busiest days of the month for prescriptions and at the time of the error, one member of staff would have been at the Post Office collecting the prescriptions so we would have been one member of staff short.' (CP71) *'At the time of the incident, the store was a bit busy. It is normally quite quiet.'* (CP33)

'The afternoon was busier than the morning and everyone was trying to keep up with the workload coming through the door. Roughly around 3pm, the area manager came in to see the dispenser for 5 minutes about her transfer to another branch but ended up helping us dispense the for next 30-40 minutes due to the immense workload.' (CP61)

Pharmacists made reference to an unpredictable nature of the workload and associated these to the occurrence of the dispensing error. Pharmacist CP31 identified fluctuations in workload as a challenging and pressurising aspect of the working day.

'I always feel highly pressured at this time of day [when error occurred]. I have previously discussed this with the pharmacy manager but we agree that the biggest issue is prescriptions coming back at the last minute from surgeries and despite continual prompting from the prescription coordinator, the management of this continues to be out of our hands, as does the unpredictability of staff sickness etc.' (CP31)

As identified by CP31, an unpredictability of staff sickness also compounds to create erratic levels of workload that demand a higher level of performance from relatively fewer individuals in order to maintain effective functioning of the dispensary.

Similarly, for some dispensing error incidents, pharmacists associated erratic workloads to times when dispensary support staff were on a rest break. The dynamic and unpredictable nature of the dispensary workflow was seen at times to place demands beyond the capacity of the dispensary team.

'She [the dispenser] went on her 30 minute break at 6.10pm. As she went, the shop became busy and I was serving on the till.' (CP38)

'The dispenser had maybe a 5 minute break for lunch and had come in early to try to get caught up, it really was mad! There was no way that I would be able to give out all the methadone myself given the level of work.' (CP45)

In other cases, a high level of workload was attributed to backlog of work from previous days.

'On the day of the error, I was dealing with a backlog of prescriptions from the previous bank holiday and I was dispensing/labelling and checking scripts on my own.' (CP37)

'It was a busy day for me as I had been off work the previous week and had returned on the previous day (Tuesday) to a large backlog of work, especially paperwork and general problems, I was therefore trying to do more than usual with the given time.' (CP39)

'The store was busy because it was half term and operationally it was running behind schedule.' (CP50)

However, in almost one fifth (n=14/77) of the cases, pharmacists associated the high levels of workload with task switching and multitasking.

'In hindsight I was trying to do too many things at the same time.' (CP15)

'I was continually in the situation to resolve 34 problems in the same time.' (CP70)

This was especially the case when pharmacists were short staffed or working on their own.

'Unfortunately, I was trying to sort out 2 other queries at the time (one relating to a missing methadone script and the other an out of stock issue) and missed the error.' (CP40)

'At the point of checking the prescription I was the only person in the dispensary. During this time I was solely responsible for labelling, dispensing, checking, dealing with queries, over the counter directed to the pharmacist and also handing controlled drugs on instalment prescriptions.' (CP22)

Multitasking and task switching was associated reduced or divided attention being given to the task at hand, resulting in a greater likelihood of errors occurring.

'I had to split my attention on counter sales/advice, walk-ins prescriptions, prescriptions collected from the surgery, the phone, the care home room upstairs and pressure from the store manager to conduct medicines use reviews.' (CP17)

'At the time of error, I believe a lapse of concentration between the various jjobs has allowed an error to occur.' (CP11)

Support staff shortages

Issues relating to dispensary support staff was the second most prominent theme that emerged. In over half (n=40/77) of the dispensing error incidents, pharmacists associated staff shortages to the occurrence of the dispensing error. Staff shortages arose from under-staffing, unpredictable staff absences due to sickness, and unavailability of staff due to rest breaks or carrying out duties away from the dispensary.

The issue of under-staffing was cited as a source of frustration and safety concern for the pharmacist and dispensary staff on the day of the dispensing error. The comments

made by CP15 reflect an unwillingness of the company to provide an adequate level of staff cover to meet the needs of the pharmacy.

'The staff were expressing their unhappiness at not having adequate staff hours and experience, complaining that the company were not willing to pay to advertise in the local paper...' (CP15)

'I really feel that the staffing levels need to be addressed, as shown by the fact that an error went out, it isn't really safe.' (CP45)

'When I first arrived at the pharmacy to work as a locum... I was quite surprised that there would be no dispensers with me on the day... I believe that the error could have been avoided if I had been working with a dispenser as I would have double checked the script with them and they may have pointed out that I was looking at the wrong date.' (CP73)

Staff shortages amount to an added pressure on the pharmacist, often resulting in the pharmacist working on their own.

'There was a lot to do and we had no qualified dispenser. The counter assistant helped a little but couldn't do much as there were a lot of people she had to serve.' (CP42)

'I was on my own for all 4 working hours, without any dispenser in dispensary area.' (CP70)

Unexpected staff absences primarily due to sickness was also a commonly cited cause of staff shortages, and work pressure for pharmacists.

'On the day in question, the counter assistant was off sick, leaving only myself and the dispenser/counter assistant to cover the dispensary and the shop.' (CP34)

'On the day in question the most experienced dispenser on the morning shift had called in sick. Therefore the dispensary was under pressure but tried to some extent to regulate its own workload.' (CP72)

However, in some dispensing error cases pharmacists reported working on their own despite sufficient levels of support staff. These were instances where dispensers were on their breaks, attending to tasks elsewhere in the dispensary or seeing to an increased number of patients presenting to the pharmacy.

'At the time of the incident the dispenser had gone on her break, as she had not taken her break before.' (CP22)

'Because I was alone at that time and the dispenser was having her tea break, I took it upon myself to dispense the script which was for Zomorph SR 10mg capsules.' (CP28)

'The store assistant takes a break mid to late afternoon and dispensary staff including myself, have to cover the store and man the tills. I do recollect having to dispense, serve at the till on several occasions, then returning to dispensing duties. One dispenser was dealing with Nomad trays, the other dealing with received fax and collection repeats.' (CP65)

Inadequate staff training

Inadequate training of the dispensary staff was mentioned by a quarter (n=19/77) of pharmacists in relation to the occurrence of the dispensing errors. Whilst relating the incident, CP14 identifies how sufficient staff numbers can be ineffective in instances where staff training is lacking.

'I feel that in the lead up to this incident I was working alongside a very nervous and possibly under trained member of staff.' (CP08)

'Staff levels were normal for Monday, although only one of the five members of staff working that day had actually completed any formal pharmacy training.' (CP14)

CP04 in relation to a dispenser undergoing training writes,

'She [the dispenser] is the process of training and unfortunately makes countless mistakes...the pharmacy is reasonably quiet after about 7pm so I just have a mental note to triple check absolutely everything she [the dispenser] dispenses.' (CP04)

The pharmacist is vigilant of possible errors made by the dispenser and finds quieter times to make additional checks on the medicines dispensed by her. Likewise CP13 talks about exercising greater caution whilst working alongside an untrained counter assistant.

'The counter assistant is not trained and had only been covering during Easter holidays from university so I had to keep a close eye on all sales and advice.' (CP13)

Similarly, CP03 considered a dispenser undergoing training unsuitable to help in dispensing and checking of the medication and chose to do both dispensing and the final accuracy check. Being conscious of the patient in the waiting area resulted in the pharmacist to increase the pace of the dispensing and final accuracy check stage, in attempt to reduce the waiting time for the prescription. Reflecting on the incident, CP03 writes,

'In hindsight, I probably did not leave enough time between doing the dispensing and the accuracy check as I was aware the patient was waiting.' (CP03)

The comment made by CP39 in relation to a trainee dispenser is interesting. Whilst the pharmacist has played an active role in identifying errors made by the trainee dispenser her use of words *'until now'* reflect the potential of errors ultimately passing through the safety measures put in place by the pharmacist.

'My trainee dispenser has a poor accuracy record, however until now have managed to spot potential problems, correct them and continue to educate her on them.' (CP39)

Pressure due to waiting patients/delivery driver

A pressure to speed up the dispensing process due to an awareness of patients/delivery driver waiting was cited as the third (n=37/77) most common contributory factor in the dispensing error incidents.

'The pressure was intense on this particular evening due to the increasing number of walk-in prescriptions, interims and knowledge that a few patients' monthly medication had to be checked and delivered as soon as possible with the driver who was waiting.' (CP21)

In many cases, pharmacists resorted to speeding the dispensing process and checking procedures in order to deal with demanding and impatient patients as quickly and efficiently as possible. In some cases, pharmacists related explicit language and abusive behaviour as factors that caused pharmacists to speed the dispensing process.

'He [the patient] was standing quite close to the entrance of the counter which caught my attention and he was being loud and with company. I quickly tried to find his prescription to check. I remember feeling rushed to get it done and so he would not cause a scene in the pharmacy because it was a busy shop. The shop assistant said to him it was not ready and needed to be checked and I recall the patient being loud and impatient so I quickly checked it and handed it to the shop assistant and she said 'it's ready now hang on'.' (CP41)

However, in most cases, just an awareness of patients' presence and implicit cues in patients' body language had a negative impact on the pharmacist's ability to correctly dispense the medication.

'I remember the patient in question was showing her impatience in her body language towards the staff and myself – sighing a lot and not happy about the wait.' (CP46)

'When the incident occurred there were lots of people in the shop and it was a busy very time for all the staff. Customers were getting agitated as waiting times were up to 45 minutes. I checked the item against the script and returned it to the dispenser to be bagged up and handed out.' (CP16)

Upon reflection, pharmacists CP13 and CP43 identify how speeding up the dispensing process can distort the cognitive processes involved in dispensing and checking prescriptions, and impair pharmacist's judgements.

'I was trying to get the faxed prescription ready as soon as I could due to the mother waiting so long in the pharmacy. I realise now that this caused an error in my judgement and I misread the prescription.' (CP13)

'Even though I had a mental break from scripts to deal with another customer, I was rushed to get back and complete the script.' (CP43)

However, in a few of the cases, pharmacists felt rushed to supply medications to patients who they felt urgently needed them. CP14 reflects upon the dispensing error incident where he supplied a sustained-release form of morphine sulphate tablets instead of normal-release. The pharmacist being aware of a representative waiting to collect the prescription combined with an appreciation of the indications for which the medication is used compounded to the pharmacist speeding the dispensing process whilst believing that he is acting in the best interest of the patient.

'Due to the nature of the drug and the fact that there was someone waiting to collect it as soon as possible, I did not see the need to delay the process.' (CP14)

Distractions and interruptions

Of the seventy seven pharmacists, twenty six (34%) linked an interruption or distraction during the dispensing process to the occurrence of the dispensing error. CP03 writes,

'There were also customers with queries/wanting to buy OTC medicine, hence interrupting the dispensing process.'

The stage of the dispensing process at which the interruption or distraction takes place appears to be of importance as sixteen of the pharmacists experienced an interruption or distraction during the final accuracy check, which resulted in the error not being identified.

'I checked the first item MST® [Morphine Sulphate] 30mg and ensured it was correct and then the second item but do remember an interruption in regards to another patient.' (CP02)

'It could have been a reading error during the final check which might have been led by distraction of any kind.' (CP58)

As mentioned in the previous section, CP04 explains how an awareness of a queue of patients, can put pharmacists under pressure to perform faster, which consequently led to the pharmacist to be distracted and unable to devote his full attention to the task at hand. CP04 writes,

'When I turned up on this day, it was straight into the action with many distractions, prescriptions and patients waiting... I do realise the buck stops with me, I should have used my proper checking technique and I was not focussed enough.' (CP04)

'During this stage with patients waiting and with the large number of disruptions caused by counter and phone queries, I failed to pay sufficient attention with the checking process of the prescription. I allowed myself to be distracted by my staff with queries on the counter and by phone

and failed to finish the task in hand, i.e., the checking of each prescription order with total concentration and without distraction.’ (CP56)

Unorganised/cluttered/small dispensary

In almost a quarter of the incidents (n=18/77) pharmacists alluded an unorganised/cluttered/small dispensary to the occurrence of the dispensing error. *‘There were boxes of order from previous days that had not been put away because of lack of staff/time (and also had to be rooted through looking for items for some prescriptions!!).’ (CP45)*

A lack of space, particularly in the checking area combined with cluttered and unorganised work space was viewed as a hindrance in the normal dispensing and checking process.

‘A lady had come in asking for an owing and they could not find it so everyone was in the dispensary and they were all finding the missing item – the dispensary is quite small so it became pretty cramped. The dispensing/checking bench was cluttered.’ (CP33)

‘I remember thinking that the dispensing benches seemed disorganised and cluttered. The pharmacy was busy and the checking bench was separate and cleared of clutter by me.’ (CP06)

In some cases, pharmacists reported there being no separate area designated for checking prescriptions, with one pharmacist resorting to use the sink for checking space.

‘The sink was often used as a checking area due to the lack of bench space.’ (CP09)

‘Bench space was limited due to the two separate computer systems and their associated printers. There was no separate checking bench for incoming stock.’ (CP72)

The position of the checking area and the degree of disorder in it was also viewed as factors that can impact the accuracy of dispensing. CP61 made reference to the checking area facing the shop floor. This was seen to be an invasion of privacy and a source of distraction during the final check - a critical stage of dispensing the dispensing process.

'I started to do the prescription straight away from the main checking area because it was too busy/noisy. It was also very cluttered and there was no room. The other checking bench where the instalment prescriptions are usually done was even more messy and I ended up checking on top of the file that the instalment prescriptions are kept in.' (CP19)

'The pharmacist checking bench was facing the shop floor and felt very small at times as nearly all prescriptions that were being brought in by patients had many items and bulk in quantities.' (CP61)

Lack of rest breaks

Around 12% (n=9/77) of the pharmacists attributed the dispensing errors to a lack of rest breaks.

'I hadn't had any lunch or any break at all since 9.00am because I was not entitled to any break.' (CP25)

'As the pharmacy did not close for lunch I was unable to take a completely uninterrupted break.' (CP06)

'I had been working without a formal break since 09:00.' (CP26)

Pharmacist CP39 provides an insight into the decision making process made by a non-pharmacist manager to keep the pharmacy open during the lunch hour as a way of maximising profits at the expense of the lunch break taken by the pharmacist and the support staff.

'Another factor that has caused problems is that we now open throughout the day, whereas we used to close between 1 and 1.30pm for lunch, my colleague and I are very unhappy about this as that hour enabled us to leave the premises and clear our heads before. It was intention from our area manager (non-pharmacist) that we would have a pharmacist available throughout the lunch hour but I insisted that a break was vital... It was purely a financial move I believe to open at lunch time as we are a high turnover... It is often also impossible to leave the premises during lunch as there is sometimes only 1 staff member on duty and it would not be safe for them.' (CP39)

Summary of theme one

High workloads, staff shortages and pressure to speed up the dispensing process due to waiting or impatient/demanding patients/delivery drivers were the top three factors associated with the occurrence of dispensing errors. The dynamic nature of the dispensary environment and the dispensing process means that the relationship between these factors and the occurrence of dispensing errors is complex and difficult to characterise.

4.7.2.2.2 Impact of the dispensing errors on the pharmacist

Whilst not an aim of the present study, analysis of the dispensing error reports showed the emergence of a key theme related to the impact of the dispensing errors on pharmacists' practice and confidence. In a majority of cases, the dispensing error proved to be a critical point of reflection and instilled caution within the pharmacist's practice. Upon reflection, pharmacist CP31 expresses feelings of upset and regret over her failure to maintain the professional standards by which she governs her work. Her reference to '*circumstances*' reflects her efforts to prioritise professionalism and patient safety despite circumstances that prove to counter these efforts.

'I am genuinely a caring, conscientious professional who puts patients' needs and well-being to the fore and am truly concerned and upset that

I have allowed my standards to be compromised by circumstances.'
(CP31)

Similarly CP67 uses the dispensing errors as an opportunity to revise and restate the standards by which she practices.

'As a pharmacist I take my responsibility of care towards patients very seriously and look to provide each customer/patient with a service that promotes their safety and wellbeing as much as humanly possible.'
(CP67)

However, for some pharmacists, the dispensing error incidents destabilised their confidence.

'Understandably the incident has shaken my confidence.' (CP02).

'I was very upset and shaken.' (CP67)

For one pharmacist however, the shock of having made a dispensing error distressed her to such an extent that she deleted the record of supply from the patient medication records (PMR) as a way of destroying any evidence of the error. Despite having been a genuine and inadvertent dispensing error, the strong emotional response distorted her normal thought processes and reasoning.

'I was very distraught by this point because the daughter alleged that the labelling error contributed to her father's death. I started to panic and I undone the entry on the PMR on the 06/01/12. I don't know what went through my mind or why I did it. It was the upset and shock that led me to do it. I know I shouldn't have done it and it was done completely innocently and there was nothing malicious in it whatsoever.' (CP63)

However, in most cases, the occurrence of the error proved to be a critical incident and a source of learning and bettering their practice.

'I feel awful that this error occurred while I was responsible for the branch and have been thinking about how it happened and how it could be avoided in the future.' (CP45)

'I feel that I am also responsible for the error that occurred and this has made me, more weary of my working procedures.' (CP08)

Outcome for the pharmacist

Whilst for most pharmacists the occurrence of the dispensing error proved to be an upsetting but critical point of learning, for a minority the occurrence of the dispensing error had an adverse impact on their health and well-being and their career prospects.

For example, for CP74, the occurrence of the dispensing error undermined her confidence in her role as a pharmacy manager, which resulted in her terminating the position and returning to her previous role.

'I have returned to my former employment as relief [after terminating my current role as pharmacy manager]. I have analysed the events on the day of the incident and realise I lost concentration and did not follow my checking procedures and the final check process. I will in future focus when I'm checking and not cut corners and rush.' (CP74)

However, for a few pharmacists, the occurrence had a more considerable impact. One pharmacist viewed the dispensing error as an indication that he needed a break from work and as result decided to join the non-practising register.

'I'm also temporarily taking some time out from work and have joined the non-practising register, the long hours of locumming becomes pretty exasperating and this error has highlighted to me that I need a break.' (CP01)

For another pharmacist, the occurrence of the first inadvertent error proved to be a signal indicating the end of the pharmacist's career. The error had a considerable

impact on the pharmacist's health and well-being for which he needed medical treatment.

'I have been devastated by the incident which has never happened to me before. I have been to my GP, signed off not fit to work and started on antidepressants.' (CP72)

Summary of theme two

The occurrence of a dispensing error can have a positive and a negative impact on a pharmacist. In a majority of cases, the occurrence of a dispensing error can prove to be a critical point of reflection and learning. However, for some, the occurrence of a dispensing error can have an adverse impact on the pharmacist's practice and well-being, ranging from destabilising the pharmacist's confidence in their abilities, to impairing their ability to continue practicing.

4.7.2.2.3 Learning as a result of the error

Over a third of the pharmacists (36%, n=28/77) made mention of any learning they gained as a result of the error, and strategies they identified to avoid the occurrence of errors in future. Analysis revealed two key approaches taken by pharmacists; reactive learning and proactive learning.

Reactive learning

In a majority of cases the approach taken to learn from the error was reactive in nature. For example, reactive learning as a result of the error involves providing a solution to the problem after the error has taken place. CP48's response to the error involved identifying solutions that can avoid the occurrence of an error with the same drug.

'We have now placed all the prednisolone formulations on the same shelf and the shelf is surrounded by yellow tape to highlight it.' (CP48)

A similar approach was taken by other pharmacists, including CP54, CP71 and CP11 who state,

'I have placed a warning alert note on the shelf of valsartan to take care regarding valsartan mix-up, to reduce the risk of future mistakes.' (CP54)

'I then put in place measures to prevent this from happening again — I separated the drugs on the shelf; put warning stickers on the shelves and a warning message on the patient medication record.' (CP71)

'Have appropriate waiting times on prescriptions... realistic and a reflective of the current workload.' (CP11)

In all of these cases pharmacists rectified only the problems that they considered contributed to the errors, without identifying other problems, which may be errors waiting to happen.

Proactive learning

In a few cases, pharmacists employed a proactive approach to learn from the errors and avoid dispensing errors occurring again. Proactive learning took a more holistic approach to analyse the errors and formulate solutions prior to the occurrence of dispensing errors in the future. Proactive learning often took the form of reviewing SOPs, auditing the dispensing process, keeping error logs and identifying gaps in knowledge that need addressing.

'I am currently in process of reviewing my accuracy checking technique as well as key standard operating procedures, carrying out a root cause analysis as part of CPD and how to deal with complaints and action any findings.' (CP61)

CP08 identified the need to record any errors and near-misses as a way of learning from prior mistakes.

'I have also learnt that since I am a locum pharmacist, it is in my interest to record my colleagues' and my own near-misses in all branches that I work.' (CP08)

Pharmacist CP51 on the other hand took a proactive approach to learn from an error involving Innohep. Due to an unfamiliarity with the product, CP51 identified the need to address his gap in knowledge about the drug tinzaparin and its various products to avoid future errors involving the same drug.

‘Since the incident I researched the various different products of Innohep to familiarise myself with their range of products. This will better prepare me for the next script I dispense/check for tinzaparin.’ (CP51)

Summary of theme three

The occurrence of a dispensing error can be an important source of learning for pharmacists. A majority of pharmacists take a reactive approach to learn from errors, whilst a few will take a more proactive approach to learn from errors and avoid future occurrences.

4.8 Discussion

The results of this study provide an overview of the individual, organisational and technical factors at play at the time of a dispensing error in community pharmacy. The findings support previous research which suggests that most dispensing errors involve selection of the wrong item, followed by selection of the wrong strength, and wrong quantity (Ashcroft et al., 2005, James et al., 2009). Whilst previous research has shown that 95-99% of dispensing errors are detected by pharmacists and pharmacy technicians during the final accuracy check (Anto et al., 2013), at present very little is known about the number of prescriptions that actually undergo final accuracy check. This study has shed light on the number of dispensing errors in which a final accuracy check was not performed; with over a quarter of dispensing errors in this study not having had a final accuracy check performed. The RPSGB recommends that all dispensed medicines undergo an independent accuracy check by a pharmacist or an ACT prior to supplying the medication to the patient (Royal Pharmaceutical Society of Great Britain, 2015). However, given that a quarter of prescriptions in this study had not undergone a final accuracy check is a stark finding that highlights the importance of the final accuracy check. It also raises concerns as to the reasons why pharmacists

have been unable to perform a final accuracy check on a considerable number of prescriptions.

Previously published research examining the outcome and degree of harm caused by dispensing errors specifically in community pharmacy is scarce. To our knowledge, this is the first study to investigate the degree of harm arising directly as a result of dispensing errors in community pharmacy. This study found that almost three quarters of the patients ingested the incorrectly dispensed medication and that 55.4% patients suffered no harm as a result of the dispensing error. However, a review of the medication incidents reported to the National Patient Safety Agency (NPSA) via the NRLS between January 2005 and June 2006 revealed that the majority (82.8%) of incidents resulted in no harm (National Patient Safety Agency, 2009). A possible explanation for the higher rate of harm induced in the present study may be due to the fact that the National Patient Safety Agency (2009) reports medication incidents across all stages of the medication pathway as well as across all healthcare settings, and not specifically incidents taking place during the dispensing process in community pharmacy. These differences in findings then raise the question whether the dispensing process in community pharmacy is associated with a greater degree of harm, and highlight the need for more robust research to determine the degree of harm arising from dispensing errors within community pharmacy.

This study found a statistically significant negative association between the SHPP and the monthly prescription volume suggesting that the risk of harm associated per prescription was greater for lower prescription volume pharmacies compared to higher prescription volume pharmacies. While there is a growing body of evidence to suggest that high-prescription volume correlates positively with the rate of dispensing errors (Bond and Raehl, 2001, Szeinbach et al., 2007), research conducted by Grasha and Schell (2001) found that the rate of errors was greater in both the low and high-prescription volume pharmacies suggesting that the relationship between these variables may be difficult to characterise. In keeping with the findings of Grasha and Schell (2001), the results of this study suggest a complex relationship between these variables. Grasha and Schell (2001) posit that a possible explanation for a low-

prescription volume being associated with an increased likelihood of an error occurring may be due to reduced task engagement arising as a result of boredom. The results of the qualitative study provide a further insight into the relationship between the workload and dispensing error variables. Whilst a high workload was by far the most commonly cited contributory factor that pharmacists associated to the dispensing errors, pharmacists often associated a workload above the normal level to the occurrence of dispensing errors. Furthermore, a backlog of work or queries can also compound to a higher workload level, which is not always portrayed in prescription numbers.

Similarly, this study also found a weak but significant negative association between the SHPP score and the number of hours worked on the day of the error suggesting that working fewer hours may be associated with a greater risk of harm per prescription dispensed. This is an interesting finding as it is contrary to a prior assumption that working longer hours may be associated with an increased likelihood of error occurrence. Furthermore, working long hours has also been a factor implicated in some of the high profile dispensing error cases (Andalo, 2016, Gosney, 2010). A possible explanation for a negative association between SHPP and the number of hours worked on the day of the error may be that pharmacists working fewer hours may not be entitled to a rest break or may choose not to take one. Furthermore, in a fashion similar to that explained by Grasha and Schell (2001), working fewer hours may undermine a pharmacist's ability to engage in the task.

A significant negative correlation was also observed with the total staff present at the time of the error as well as the number of trained as well as untrained staff present at the time of the error and the SHPP. Contrary to expectation, a significant but weak negative correlation was also observed between the number of untrained staff and the SHPP suggests that the presence of a greater number of staff at the time of the error regardless of the level of training has a beneficial effect. In addition to this, cross-tabular analysis of insufficient staff with the final accuracy check variable produced a significant level of association between the variables. Furthermore, insufficient staff was also the most common contributory factor in this study. The results of this study

are in agreement with previous findings that suggest community pharmacy is an under-staffed profession (Ashcroft et al., 2005, Bond and Raehl, 2001, Gidman et al., 2007, James et al., 2009, Malone et al., 2007). It should be noted however, that within the community pharmacy context, staff shortages may not be the sole contributory factor in error occurrence. The qualitative study added further clarity. Whilst the number of staff present on the day of the dispensing error may be sufficient, the fluidity of the dispensary staff to manage (or as one pharmacist described, 'float' between) the medicines counter and the dispensary during busy periods, or see to other duties in the dispensary may be the cause of reduced dispensary support staff present at the time of the error. The qualitative study also suggests that pharmacists may be reluctant to utilise inadequately trained or 'prone to errors' dispensary staff. The results of this study suggest that a review of staffing levels within community pharmacy, as well as adequate support staff training to allow the correct utilisation of pharmacy support staff may be a measure required to mediate safer dispensing practices.

In line with previous research, staff shortages and the pharmacy being busier than normal were found to be common contributory factors to the occurrence of the dispensing errors (Ashcroft et al., 2005, Bond and Raehl, 2001). It is worth mentioning however, that the term 'busyness' within the community pharmacy context lacks definition. The presence of patients or a waiting delivery driver in the pharmacy may lead to perceptions of increased 'busyness' amongst pharmacists and lead to the pharmacist increasing the pace of dispensing and checking. The nature of the pharmacy profession is that it is demand driven; patients can present to the pharmacy with a prescription at any time during the functioning hours of the pharmacy, as opposed to appointment based systems in general practice and other healthcare professions (Ashcroft et al., 2005). This means that there can be unpredictable periods of high work activity which demand a faster work pace. Such fluctuations in workload create an imbalance in the workload requirements of a pharmacist which means that effective management of workload is not always possible and this can increase the likelihood of a pharmacist making dispensing errors.

Pharmacist fatigue/no rest breaks was the third most common contributory factors cited by pharmacists in the quantitative study. The quantitative study also revealed a weak but statistically significant correlation between the rest break taken per hour worked and the SHPP highlighting the safety benefits of pharmacists taking a rest break during their work. Additionally, a lack of rest breaks emerged as a theme related to the contributory factors in the qualitative study. These findings mirror those of the previous studies that have highlighted deteriorating working conditions, with pharmacists working longer hours with a lack of rest breaks and, as such have raised concerns over compromised patient safety (Gidman, 2011, Gidman et al., 2007, McCann et al., 2009a).

Very little was found in the literature review about the technical factors that may contribute to the incorrect selection of medication, for example the layout of the dispensary and the close proximity of drugs on shelves. The results of the quantitative study suggest that ergonomic factors do appear to have a perceptible impact on the potential for error occurrence with 30.7% of pharmacists citing the layout/close proximity of drugs and 20.5% citing a small/crowded/unorganised dispensaries as factors contributing to the dispensing error. This is in keeping with previous research which suggests that the presence of several LASA drug names in close proximity to one another increased the likelihood of a selection error (Irwin et al., 2013). The findings of the qualitative study complement the results of the quantitative study with a quarter of pharmacists alluding a small/crowded/cluttered dispensary to the occurrence of dispensing errors. Furthermore, the design of workplace environments may influence the working practice of pharmacists, as this study found a significant association between the location of the pharmacy and the likelihood of the pharmacist performing a final accuracy check.

At present research investigating the individual factors associated with dispensing errors is scarce. Fifty five percent of dispensing errors in this study were made by male pharmacists, whereas 45% were made by female pharmacists. The proportions contradict the demographics of the pharmacy profession which has undergone a gender shift over the last thirty years and in the UK 56.9% of pharmacists on the

register were female (Seston and Hassell, 2009). Furthermore, cross-tabular analysis of the gender variable with the final accuracy check variable produced an association tending towards statistical significance. This study highlights the need to research the relationship between these variables further.

4.8.1 Strengths and limitations

This study provides an in-depth exploration of the nature and contributory factors of dispensing errors in community errors. To our knowledge, this is the first study to explore and create a profile of actual dispensing errors that have taken place in community pharmacy. A key strength of the present study is the large sample sizes in both the quantitative and qualitative studies. Furthermore, both studies reached a point of data saturation, whereby collection of further data produced no change in the results. Despite the exploratory nature of this study, it has provided some useful insights into the nature and contributory factors of dispensing errors, and has highlighted the need for further research to examine and characterise the relationships between the occurrence of dispensing errors and the contributory factors and pharmacist and pharmacy demographics.

However, due to the retrospective design of the present study, its findings have limited generalisability. Perhaps the main limitation of this study has been the missing data. However, by applying the pre-specified inclusion criteria, the proportion of missing data was limited to no more 6%. This is just slightly above the 5% level which according to (Schafer, 1999) is the margin below which missing data can be considered to be inconsequential. Furthermore, there is no certainty that the IRFs have been completed honestly. There could also be a possibility of social-desirability bias, where pharmacists respond in a way that shows them in good light, and a recall-bias, where pharmacists are unable to recall correctly the dispensing errors. There is also a likelihood of under-reporting for errors that pharmacists consider to be trivial or errors that have taken place but did not progress to an extent that the pharmacist felt the need to report to the indemnity insurance provider.

4.9 Conclusion

This study has employed both quantitative and qualitative approaches to retrospective database analysis to explore the nature and contributory factors of dispensing errors in community pharmacy. The results provide an overview of some of the individual, organisational and technical factors at play at the time of a dispensing error. The findings suggest that increasing levels of workload, staffing levels, staff training, working hours, lack of rest breaks, type of pharmacy setting and layout of dispensary may be associated with the occurrence of dispensing errors. However, the results highlight the need to examine further and characterise the relationships between these factors and dispensing error occurrence.

Chapter 5

Qualitative research interviews with community pharmacists

5.1 Overview

This chapter will present the findings of study 2, a qualitative study that explored community pharmacists' perceptions of factors contributing to dispensing errors, their experiences following a dispensing error, and the impact that these experiences and the occurrence of the dispensing error have had on the pharmacists' practice. First, existing qualitative research exploring the experiences and attitudes of community pharmacists towards dispensing errors will be discussed. This will be followed by a review of the choice of methods – semi-structured face-to-face interviews, data collection and qualitative analysis techniques will be compared and presented. The results of the study, with key emerging themes, supplemented with narrative accounts of the participants will be presented. The overall findings of the study will subsequently be discussed.

5.2 Background

Several studies, mainly qualitative and some quantitative, have been carried out after the community pharmacy contractual changes of 2005 to explore the experiences, attitudes and perceptions of community pharmacists towards various elements of their working environments for example, working conditions, workload, work stress and pressures and job satisfaction. Whilst none of these studies explored specifically the experiences and perceptions of community pharmacists towards dispensing errors, the issue of dispensing errors and patient and medication safety is an ostensibly frequent concern raised by pharmacists in these studies. Moreover, these studies have shed light on various organisational, individual and professional factors that can

potentially influence patient/medication safety, specifically, the occurrence of dispensing errors.

Without exception, organisational factors in community pharmacy is a key issue apparent in previous research studies. A review of previous literature suggests that increasing workload, low staffing, inadequately trained staff, target driven work environment amid deteriorating working conditions are all key concerns amongst community pharmacists, particularly after the community pharmacy contractual changes (Bond et al., 2008, Eden et al., 2009, Gidman, 2011, Gidman et al., 2007, Hassell et al., 2011, Jacobs et al., 2011, Johnson et al., 2014, McCann et al., 2009a, McCann et al., 2009b, Schafheutle et al., 2011, Seston and Hassell, 2014). Also, previous research is indicative of an association between increasing workload and increasing levels of stress and decreasing job satisfaction (Eden et al., 2009, Gidman et al., 2007, Hassell et al., 2011, Johnson et al., 2014).

Inadequate staffing levels and training is an issue that is commonly raised by community pharmacists. Research suggests that pharmacists lack confidence in staff abilities, which prevents effective delegation of tasks resulting in an increasing work burden carried by pharmacists (Lea et al., 2016). These factors, along with a lack of management support and a commercialised approach to the provision of clinical services in poor working conditions is also thought to be associated with increasing levels of stress and work pressures and decreasing job satisfaction (Eden et al., 2009, Gidman, 2011, Gidman et al., 2007, Johnson et al., 2014, Phipps et al., 2009). Furthermore, increasing levels of multi-tasking and interruptions, arising as a result of heavier workload and/or higher dispensing volumes has been associated with an increased likelihood of a dispensing error. For example, a quantitative study employing a cross-sectional postal survey methodology conducted by Johnson et al. (2014) found a significant association between higher dispensing volumes and respondents reporting one or more dispensing errors in the previous month. This would suggest that, given the sustained increase in dispensing volumes, the likelihood of a dispensing error occurring is increasing too. Some evidence suggests that organisational factors such as increasing workloads, work-life balance and

deteriorating working conditions may be having an impact on the health and well-being of community pharmacists (Gidman, 2011, Gidman et al., 2007, Johnson et al., 2014). For example, qualitative studies carried out by Gidman et al. (2007) and Gidman (2011) suggest that work intensification may be linked to reduced health and well-being of pharmacists and a reduced quality of life. Research also suggests that organisational factors may influence the mental/psychological health of pharmacists (Gidman, 2011, Johnson et al., 2014). For example, McCann et al. (2009a) found pharmacists reported reduced concentration levels later in the day if they had experienced interruptions during their lunch break. A mixed methods study carried out by Bond et al. (2008) found that 58% of pharmacists reported feeling stressed at work, with 24% reported working longer hours after the community pharmacy contractual changes.

Concerns surrounding professional issues is also a key theme apparent in previous research studies. As discussed in chapter 1, the community pharmacy contractual framework, which was implemented in 2005 (Anderson, 2007), sought to expand the role of community pharmacists (Bond et al., 2008). However, studies conducted shortly after the implementation of the contractual changes indicate that aspirations for role expansion are still a work in progress (Gidman et al., 2007). The study conducted by Bond et al. (2008), the fieldwork for which was undertaken between September 2006 to April 2007 – just a year after the new community pharmacy contractual framework, revealed that only 17% of pharmacist were more satisfied after the community pharmacy contractual changes compared to before the contractual changes. The study also asked respondents to rate various aspects of their jobs. The respondents rated the role of the pharmacist as the third least satisfying aspect of their job. Similarly, Eden et al. (2009) found that feelings of being undervalued and underutilised, and unable to use clinical skills due to high and conflicting workload demands were factors that influenced the decision made by recently qualified pharmacists to leave the profession. These findings are also mirrored in the survey conducted by McCann et al. (2009b) in which 24% of community pharmacists reported that they would not choose the same profession again. However, it may be argued that these studies were conducted too soon after the

contractual changes and therefore may be an improper reflection of the workplace pressures arising after the contractual changes.

5.3 Aim

To explore the perceptions and experiences of pharmacists following a dispensing error and the impact that the occurrence of a dispensing error has on a pharmacist's practice.

5.4 Methods

5.4.1 Study design

An inductive approach was taken to analyse the qualitative data gathered in this study. The study employed semi-structured face-to-face interviews as the data collection method. The rationales for choice of methods and analysis will be provided.

5.4.2 Ethics

The study was approved by Aston University Ethics Committee on 22nd September 2015 (Application #760).

The main ethical concern raised for this study surrounded around the procedures that were put in place to access details of the participants from the source, the PDA database. That is, how will the balance between getting participant details and client confidentiality (which the PDA would be expected to offer) be maintained. In order to achieve this, the recruitment procedure was further clarified. The PDA will contact its clients first with the research proposal, and those that are interested in taking part will be provided with the researcher's details and be asked to contact the researcher if interested.

5.4.3 Semi-structured Interviews

Interviewing is the most common method of data collection for qualitative research (DiCicco-Bloom and Crabtree, 2006, King, 2004, Louise Barriball and While, 1994). The purpose of a qualitative research interview is to gain an understanding of the interviewee's perspective of the research topic (King, 2004). Several advantages of the semi-structured approach to collecting data were considered. First, a semi-structured interview is a useful method for exploratory research topics that are complex or where little is known about the research area. Since this is the first study exploring the experiences of community pharmacists specifically during the dispensing process, this method of data collection was considered most appropriate. Second, semi-structured interviews are considered a useful approach to answer questions from the perspective of subjective experience, enabling the individuals to be participants in meaning-generation and interpreters of their experiences as opposed to sources of information (DiCicco-Bloom and Crabtree, 2006, Saks and Allsop, 2012). This was considered very useful for the present study as it sought to explore the experiences and perceptions of community pharmacists during and after the dispensing process. Third, by adopting a semi-structured approach, the interviews allow flexibility in collecting data by enabling the interviewer to probe the participant for more information and clarification of answers and pursue emergent themes (Louise Barriball and While, 1994, Saks and Allsop, 2012). Consideration was also given to the sensitive nature of the research topic. The time and place synchrony in face-to-face interviews was considered advantageous too as it may have enabled the participating pharmacists to feel comfortable and at ease to talk about their experiences directly with the researcher.

The disadvantages of semi-structured face-to-face interviews were also considered. Face-to-face interviews can be resource intensive; time consuming and costly especially where long distances must be travelled to reach the interviewees (Opdenakker, 2006). Another disadvantage of research interviews is that they lack reliability as each interview is unique; reproducibility is unlikely (Opdenakker, 2006). In terms of data quality, face-to-face interviews may be associated with interviewer

bias, whereby the interviewee gives responses according to the implicit and explicit communication of the interviewer. In order to improve the quality of the research interviews, the interviewer attended two training sessions facilitated by Aston University on conducting qualitative research interviews.

An interview schedule is a research tool used to guide the semi-structured interview. For this study, an interview schedule (appendix 2) was developed to serve as a guide to explore the experiences and perceptions of community pharmacists towards dispensing errors whilst retaining sufficient structure to facilitate comparison between the participants. The design of the interview schedule was informed by the emerging themes from the quantitative and qualitative stages of study one. The interview schedule contained the following topics:

- Demographic information about the pharmacist
 - Employment status
 - The number of years since registered
 - Work activities of community pharmacists
- The potential of making a dispensing error
- Dispensing errors made by the pharmacist
- Feeling after making a dispensing error
- Impact of the dispensing error on work and personal life of the pharmacist
- Pharmacist's thoughts of error prevention strategies

The interview schedule was initially tested for readability and comprehensibility on a lay audience during a training session on qualitative research interviews. The schedule was then further tested and refined after conducting the first few interviews.

5.4.4 Participants

Participants were recruited from the PDA database using an inclusion criteria. The original inclusion criteria were set to include community pharmacists who had made an error and had been subject to an investigation. This was considered appropriate to gain an in-depth understanding of the experiences of community pharmacists during

and after a dispensing error and explore the impact that the investigation process had on the pharmacist's work and personal life. The initial recruitment period (using the original inclusion criteria) lasted throughout May 2016 to July 2016. The total response during this period was three community pharmacists. In the first interview the pharmacist had been subject to an investigation due to an error made during the supply of medication via Over-the-Counter (OTC) supply; this was excluded from the study as it did not fit the inclusion criteria of being an error that occurred specifically during the dispensing process. The pharmacists in the remaining two interviews had been subject to an investigation due to errors in dispensing. However, it is thought that due to the sensitive nature of the research topic, the initial recruitment stage received an extremely low response rate.

In an attempt to increase the recruitment of participants, the inclusion criteria was amended to include any pharmacist who had reported a dispensing error to the PDA regardless of whether or not the pharmacist had been subject to an investigation; this was around 5000 community pharmacists on the PDA database. After amendment of the inclusion criteria, a general approach was taken to discuss the occurrence of dispensing errors in community pharmacy rather than discussing errors that had progressed to a clinical negligence claim. The second recruitment period lasted between September 2016 and October 2016. Amendments to the inclusion criteria yielded a better recruitment of participants. A total of 10 community pharmacists were recruited during the second recruitment stage. Since the PDA has members registered across the UK, participants were recruited from a wide geographical area. A further two responses were received from Scotland, however, due to the inconvenience of extensive travel, these could not be interviewed. The two interviews conducted during the initial recruitment period were included in the study giving a total of 12 interviews for qualitative analysis.

5.4.5 Procedure

The participants were recruited via e-mail invitation (see Appendix 3) sent weekly by the PDA on behalf of the researcher. Community pharmacists willing to take part in the research interviews were directed to make contact with the researcher via e-mail

to arrange a suitable date, time and location for the research interviews. The interviews were conducted at a time and location convenient for the participant; one interview was conducted at the pharmacist's home, two were conducted at the pharmacists' workplace, and the remaining nine were conducted at cafés local to the participants. The researcher sent an e-mail to the participating pharmacists with the location and timing the day before the scheduled interview to serve as a reminder. The interviews lasted between 45 minutes to one hour and 30 minutes.

Prior to the interview, participants were introduced to the study and were fully informed of the aims of the interview. Participants were handed a copy of the participant information sheet (appendix 4) and were given the chance to read it through and ask questions if they had any. The researcher informed participants that the interviews would be audio recorded on a portable digital audio recorder to allow the interviews to be transcribed prior to data analysis. The participants were informed that anything they said in the interviews will remain confidential and that the interview transcripts and any findings of the study would maintain anonymity. The researcher confirmed that participation in the interviews was entirely voluntary and that participants were free to withdraw from the study at any point without providing an explanation. However, none of the participants withdrew from the study. Participants were asked if they were still happy to continue and give their written consent (appendix 5) to indicate that they understood what the study involved and were happy to take part. Participants were debriefed at the end of the interview and thanked for their participation.

Due to the sensitive nature of the research topic, developing rapport and establishing an interviewer-interviewee relationship was considered essential. In order to achieve this, the interviewer made frequent eye contact, displayed attentive listening by nodding, smiling and not interrupting the participant, and ensured an interested tone of voice. As a way of maintaining engagement and allowing participants to provide detailed answers to questions, the interviewer took care not to rush the interviews and paid attention to pacing the interviews such that participants could consider their answers prior to vocalising them. This was attained by allowing time after each question for participants to add any further comments if needed.

5.4.5 Analysis

The 12 semi-structured face-to-face interviews produced 13 hours, 21 minutes and 49 seconds of audio data for transcription. The interviews were analysed using framework analysis which sits within a broader category of thematic analysis (Braun and Clarke, 2006, Gale et al., 2013, Pope et al., 2000). Thematic analysis is a type of qualitative data analysis method used to identify, analyse and report patterns or themes emerging from the dataset (Braun and Clarke, 2006). The framework method of data analysis is a flexible approach of data analysis that can be adapted to various qualitative approaches as it is not confined to a particular research philosophy or epistemology (Gale et al., 2013). An essential component of qualitative data analysis is the necessity to compare and contrast data as a means of facilitating the identification of relationships between different parts of the data (Gale et al., 2013). However, qualitative methods of data collection, specifically semi-structured interviews can often produce large amounts of unstructured textual data which can be difficult to manage. The framework analysis method provides structure to data analysis and aids the organisation and management of large sets of data as it allows comparison across and within cases (Darker et al., 2011). The five stages of the framework approach are described in Table 21.

The audio recordings of the interviews were imported into NVivo (see section 4.5.5.3) and transcribed word-for-word by the researcher using the playback function. NVivo has a range of playback speeds to choose from. Playback was set at a 50% slower setting to facilitate an accurate transcription of the data. Transcribing the data also proved to aid in familiarisation of the data which is the first stage of Framework analysis.

Table 21 Stages of data analysis in the Framework approach (Pope et al., 2000)

The five stages of data analysis in the Framework approach	
Stage of analysis	Description
Familiarisation	Immersion in the raw data (or typically a pragmatic selection from the data) by listening to tapes, reading transcripts, studying notes and so on, in order to list key ideas and recurrent themes
Identifying a thematic framework	Identifying all the key issues, concepts, and themes by which the data can be examined and referenced. This is carried out by drawing on a priori issues and questions derived from the aims and objectives of the study as well as issues raised by the respondents themselves and views or experiences that recur in the data. The end product of this stage is a detailed index of the data, which labels the data into manageable chunks for subsequent retrieval and exploration.
Indexing	Applying the thematic framework or index systematically to all the data in textual form by annotating the transcripts with numerical codes from the index, usually supported by short text descriptors to elaborate the index heading. Single passages of text can often encompass a large number of different themes, each of which has to be recorded, usually in the margin of the transcript
Charting	Rearranging the data according to the appropriate part of the thematic framework to which they relate, and forming charts. For example, here is likely to be a chart for each key subject area or theme with entries for several respondents. Unlike simple cut and paste methods that group verbatim text, the charts contain distilled summaries of views and experiences. Thus the charting process involves a considerable amount of abstraction and synthesis
Mapping and interpretation	Using the charts to define concepts, map the range and nature of phenomena, create typologies and find associations between themes with a view to providing explanations for the findings. The process of mapping and interpretation is influenced by the original research objectives as well as by the themes that have emerged from the data themselves

Since the aim of the present study was to identify the range of factors contributing to dispensing errors and explore the perceptions and experiences of community pharmacists towards the occurrence of dispensing errors, an inductive approach was taken to analyse the interview transcripts. An inductive approach allowed for wide-ranging and unexpected responses that are difficult to predict in advance (Gale et al., 2013).

The interview transcripts were read and re-read as a way of immersing into the data and gaining a familiarization of the accounts given by the pharmacists. The data was then organised into codes. A semantic approach was taken to code the data. That is, coding was based on the explicit meaning conveyed by the data as opposed to a latent

approach which identifies and examines the underlying or implicit meaning conveyed by the data (Braun and Clarke, 2006). Whereas latent coding involves a greater degree of interpretation, semantic coding involves describing the patterns manifest in the semantic content as well as an interpretation to allow conceptualisation of emerging theories (Braun and Clarke, 2006). The coded data was then grouped together to form categories and sub-categories. Categories sharing commonalities in patterns and experiences were then grouped to form emergent themes.

5.5 Results

5.5.1 Participant characteristics

There was an almost even split between the gender of the participants who took part in the semi-structured research interviews; seven female and five male participants. Whilst the ages of the participants ranged from 27 to 66 years, half of the participants were aged 50-59 years. Three of the participants fell in the 40-49 years age group, with one participant in each of the following year groups: 20-29 years, 30-39 years and 60+ years. There was also a variation across the sample in terms of the number of years that the participants had been registered as a pharmacist ranging from 3 years to 42 years, with seven of the pharmacists having registered as a pharmacist for 25 or more years. Two of the participants had completed their undergraduate degree and training in pharmacy outside the UK and had practised overseas prior to registering in the UK. The majority of participants worked full-time in community pharmacy; two worked on a part-time basis, whilst one participant had recently made the decision to leave the pharmacy profession. In terms of the employment status, ten participants were employees (two were employed as relief pharmacists), one worked as a locum pharmacist, and as previously mentioned one no longer worked as a pharmacist. Just over half of the pharmacists in this sample worked in a large chain store, two in independent pharmacies, and, one in an independent pharmacy, whilst the remaining worked at variable settings due the nature of their jobs. A summary of participant characteristics is presented in table 22.

Table 22 Sample characteristics

Participant ID	Gender	Age	No. of years registered as a pharmacist	Employment status	Workplace setting	Previous experience
CP01	Female	59	38	No longer in the pharmacy profession	No longer in the pharmacy profession	Qualified in 1979 and worked as community pharmacist and manager Locummed for 2-3 years Worked outside of pharmacy for 10 years between 1999-2009 Locum since 2010 Recently left the pharmacy profession
CP02	Male	55	12	Locum pharmacist	Variable	Graduated in Spain in 1994 Registered in the UK in 2004 Employed with a multiple for a few years Management for independent pharmacy Locumming since past 11 years
CP03	Male	27	3	Employee - Pharmacy manager	Independent	Locummed for various companies Involved in pre-registration training Managing at present company for one year
CP04	Male	59	32	Employee – Relief pharmacist	Large multiple	Registered in 1984 Pre-registration in hospital pharmacy Moved to community pharmacy due to differences in salary Various management roles over the past 32 years Manager at a large multiple pharmacy 1989-2001 Relief pharmacist for large multiple since 2001
CP05	Male	48	25	Employee – Relief pharmacist	Large multiple	Pre-registration with large multiple Various management roles and locumming Relief pharmacist since the past 7 years
CP06	Female	41	15	Employee	Large multiple	1998 - Gained undergraduate training and education in South Africa 2001– registered in the UK

						Range of experience locumming for various multiple, supermarket and independent companies
CP07	Male	59	38	Employee	Large multiple	Pre-registration in hospital pharmacy and worked for six years in hospital Worked in Drug Information Dept. in hospital for a while Moved to community pharmacy due to pay differences and greater patient contact Worked at independent pharmacy most career Since 2001 working for large multiple
CP08	Female	32	4	Employee	Large multiple	Completed undergraduate education and training in 2006 Completed PhD Worked as a post-doctorate researcher for six months Registered with GPhC in 2012 2013: Locummed Apr 2015 to present: part-time pharmacist for large multiple Presently on maternity leave
CP09	Female	58	6	Employee-pharmacy manager	Large independent	Range of experience in community and hospital pharmacy
CP10	Female	49	25	Employee – part-time community pharmacy	Large multiple	Range of experience in community and hospital pharmacy
CP11	Female	66	42	Employee – pharmacy manager	Large multiple	Qualified in 1974 Pre-registration in hospital pharmacy Spent 2 years teaching basic pharmacy abroad Worked most of career in community pharmacy
CP12	Female	56	33	Employee	Supermarket pharmacy	Completed undergraduate education and training in 1983 Worked at independent pharmacy for some time Locummed for various independent and multiples

5.5.2 Thematic analysis

Thematic analysis of the interview transcripts produced three key themes: working conditions in community pharmacy, the role of the community pharmacist and experiences and attitudes of community pharmacists towards dispensing errors. Each of these themes will now be discussed using illustrative quotes from the interviews.

Table 23 Emergent themes and sub-themes

Theme	Sub-theme
Working conditions in community pharmacy	Workload
	Dispensary support staff
	Distractions
	Work pressure and stress
	Corporate culture
	Lack of response from the regulator
The role of the community pharmacist	Patient expectations and public perception of pharmacists' role
	Staff understanding of the pharmacist's role
	Professional autonomy
	Opinions about their job/profession
	Present and future plans
Experiences and attitudes of community pharmacists towards dispensing errors	Feeling after a dispensing error
	Potential of making a dispensing error
	Impact of the dispensing error on the pharmacist
	Strategies for error prevention

5.5.2.1 Working conditions in community pharmacy

Deteriorating working conditions in community pharmacy emerged as the most imperious and broad theme from the data collected. Each participant made mention of various aspects of their working conditions in relation to the occurrence of dispensing errors in community pharmacy, including: workload, dispensary support staff, distractions and interruptions, work pressures and stress, corporate culture,

unsafe work patterns, lack of rest breaks, impact of poor working conditions on the pharmacist and lack of response from the regulator to deteriorating working conditions in community pharmacy.

Workload

Increasing levels of workload requiring community pharmacists to work at faster pace under time-pressured conditions emerged as one of the most prominent sub-themes present in the interview data. Workload in community pharmacy was reported to be *'unbelievable'* (CP08), to have *'grown exponentially... at least in terms of volume of prescriptions, [around] 50% [increase]'* (CP04), expecting community pharmacists to *'do more and more'* (CP05). All participants spoke of escalating levels of workload in community pharmacy in various contexts including: conflicting workload demands, unpredictable nature of the workload, and repetition/automation. Each of these aspects will now be discussed.

Conflicting workload demands

Discussion around conflicting workload demands centred on three key aspects; the range of functions carried out by community pharmacists, workload levels reaching beyond the capacity manageable by community pharmacists and their pharmacy teams, and execution of the range of functions simultaneously (multitasking) by or in the presence of a pharmacist being a source of conflict where carrying out either function impairs the quality of the other.

'It's a big animal to deal with because not only am I looking after the dispensary, I've got all the lights and the toilets and the... We're all ordering stock today so I've had to think about that today, plus all the vaccinating. I mean yesterday I did Rabies, Tetanus, Typhoid all of that, I did about six different odd injections that were had to be reconstituted as well as the flus. Now I love doing that, but the world was going on at the same time.' (CP11)

In the above quotation, the pharmacist uses the metaphor '*big animal*' which can be difficult to tame and keep under control. She uses the metaphor to express the difficulties she faces in effectively carrying out all the functions necessary in her capacity as a pharmacy manager. Her reference to '*the world was going on at the same time*' suggests that the difficulties stem from having to carry out all these functions at the same time.

'We obviously have a lot of jobs to do, not just the dispensing side, but all the safety aspects of the job, you know doing the queries, answering the phone, getting deliveries ready, services... I was saying, we've got this minor ailment scheme running very shortly you know, I'm going to go home now and I'm going to do the work for it. And in my mind I'm thinking, how am I going to do that and how am I going to do the flu, how am I going to do the MURs, and how am I going to check everything, so sometimes seriously I think I better just pack this in you know.' (CP09)

'I mean the main problem is you're doing more and more. When you go in there's more, and you have got all these services and you know you're going to be doing all these extra things and you're still doing the dispensing, you're still giving the advice and yes... that's the main problem.' (CP05)

The above two quotes illustrate the increasing range of services that pharmacists are now providing on top of an existing high level of workload associated with the dispensing of medicines. In both cases, that pharmacists identified this as a problem. CP09 expressed that the workload demands are going beyond her capacity causing her to consider leaving the profession.

'Unless you have someone else doing the other services so you just forget about them and just concentrate on dispensing, so there is always going to be more risk.' (CP05)

'... and you're getting errors there as well because of the sheer range of functions that the pharmacist has to undertake during the day.' (CP04)

'We found that if you were labelling and dispensing , there were more errors, because you had too many functions going on at the same time, so if you're batch labelling, your concentration is just on the labelling, and then the stock for that particular lot of medicines will come in in the next morning.' (CP06)

In relation to the occurrence of dispensing errors, all participants mentioned that the increasing range of functions that community pharmacists are providing may be associated with an increased likelihood of a dispensing error occurring. Whilst CP04 and CP05 referred to an increasing range of functions outside the dispensing process, the CP06 mentioned that carrying out too many functions at the same time even within the dispensing process is associated with error occurrence. CP04 goes on to say that *'it's a complex picture'* because pharmacists may also perceive a higher workload in lower intensity (in terms of prescription volume) businesses due to the range of jobs that they're doing.

Another aspect of the discussion about conflicting workload demands related to workload levels reaching beyond the capacity manageable by community pharmacists and their pharmacy teams. All participants spoke about having to cope with increasing levels of workload, both in terms of the dispensing of medicines as well as the provision of clinical services.

'And what's sold to all of us is... professionalism is sold to us, and helping patients, and doing the best for your patients, and patient-centred care is sold to us... if you go on the Internet and you type in Walgreens, there's a video in YouTube about the pharmacists there going on strike. One of the [pharmacists] in the video says 'we're expected to do 24 items an hour'. Now 24 items an hour over 8 hours is 200 items yes? Some of the pharmacists in [a large multiple pharmacy] are doing 400 and you can't say if you do 400 items a day, day in, day out where you've constantly

got interruptions and you're expected to do all the other things in addition to it, that it's safe.' (CP04)

The pharmacist in the above example makes a very interesting point about levels of workload in relation to professionalism. Whilst on the one hand, pharmacists are being encouraged to be an epitome of patient safety and patient-centred care, on the other hand, the level of work required of pharmacists is only acting to counter these efforts. The pharmacist goes on to explain that in recent years the increasing levels of workload has made a negative impact on dispensary support staff where dispensers have been brought to tears as a result of workload pressure.

'I mean it's only in recent years I've seen dispensers cry because of the pressure that they've been placed under, and in the past two years probably four or five dispensers cried because they simply couldn't cope.' (CP04)

In addition to increasing volumes of prescriptions dispensed and greater range of clinical services being provided, the levels of workloads was also said to be increasing due to cuts in funding and advertisement of pharmacy services.

'This year we had a £15000 target on our store put onto pharmacy because of the amount of money the NHS has taken out the pharmacy, so that £15000 for us to stay open has to come from the services, where's the pressure? On the pharmacist and the team. No extra hours.' (CP06)

'More and more services seem to be coming our way... We're expected to spend more time in the consultation room you know face-to-face with the patients, but at the end of the day who's going to check all those prescriptions when they're ready to go out?' (CP09)

'Obviously, the workload is just unbelievable, but I don't know as a pharmacist... how we would be able to change that, because it's getting even worse and worse in terms of the workload, you cannot tell them [the employer/company] no I don't want to [do it], I don't want to check that

number of medication... because at the end of the day you are facing the public... not them. We [the company] are promising the patients we will order the medication for them and we will get it ready, so we cannot just say we are not getting it ready for them. So yes in terms of the workload it's getting more and more, I don't know how to defend that except from just trying to do the best you can.' (CP08)

CP06 refers to an expectation from her company to increase the provision of clinical services as a way of compensating for the financial loss of due to funding cuts. However, without supplying the resources needed, the pressure to cope with the additional workload is being placed on the pharmacist and the pharmacy team. Likewise, CP09 also mentions the added pressure due to the provision of clinical services. The quotation ends with the question '*at the end of the day who's going to check all those prescriptions when they're ready to go out?*' which suggests that she feels the work is beyond the capacity of a single individual. Similarly CP08 refers to a misalignment of the level of workload the pharmacy team is able to cope with and that being generated through company advertisements. Since pharmacists are the face of pharmacy in the public's eyes, the pressure to manage the workload ultimately lies on the pharmacist's shoulders as opposed to the company/employers.

The third aspect of the discussion surrounded around conflicting workload demands due to simultaneous provision of functions, namely the dispensing of medicines and the provision of clinical services being a source of conflict.

'I think we are quite good as pharmacists seeing A from B... we're quite good at that, but when you're in a hurry, you could give an elephant out, it's actually very easy.' (CP11)

'Just going too fast (laughs) just like sometimes you just glance, you know because you thought... you know... the dispenser has done it, just really, just a quick check... you can't sort of... you just have to be really quick you know... especially when it's busy, and then people come in waiting for ten items and you've got this to do and that to do, you've just got to

be really quick, I mean I've spoken to other pharmacists... and they say yes it is like that... and they say... oh they do all this [rushed checks].'
(CP12)

'(Laughs) It's obviously a problem... it's interesting but you can't... it's so hard to do both. So you feel pretty awkward when you've got your flu jabs, four appointments in the morning when you walk in, but everyone is coming in from the surgery, and you're walking off and they're all looking at you and you're like well sorry but I can't do much about it really.'
(CP05)

The above quotations refer to pharmacists being rushed due to the perceived pressure of waiting patients or because they have *'this to do and that to do'*.

CP11's comment that *'you could give an elephant out, it's actually very easy'* is interesting because it illustrates the considerable impact that high workload can have on accuracy of dispensing whereby it can be very easy to miss an obvious error in faster and demanding working conditions.

'You're going to have to generate that money from the services that means you're constantly multitasking' (CP06)

'I mean when you are under stress and there is kind of... there is always so much work to do, there is so much [expectation from employers for pharmacists to be] multitasking, multitasking, multitasking. But when an error happens, it's not about multitasking anymore, it's about being responsible and following the SOPs.' (CP08)

The above quotes illustrate that high levels of workload means that pharmacists are having to multitask. CP08 explains how employers expect pharmacists to multitask and breach SOPs in order to meet workload demands. However, she goes on to express her frustration over the response from the employer in the event of an error, where the attention is diverted from the need to multitask and instead the onus is laid on the pharmacist.

Unpredictable nature of workload

One challenging aspect of workload in community pharmacy which emerged from the present study is the unpredictable nature of workload. Whilst the ease of access of pharmacists is a unique advantage that community pharmacy has to offer as healthcare providers, it can also mean that the level of workload that community pharmacists have to deal with is in part determined by the patients that visit the pharmacy and their needs.

'I suppose the fact that you never know what's going to come through the door, you never know what problems you're going to get, you never know how busy you're going to be, it's very unpredictable... You can have an evening that is very quiet or you can have an evening that is very very busy, just depending on who comes in through the door.' (CP11)

Attempts to manage the workload by pre-booking services such as MURs has been an unsuccessful endeavour for some pharmacists, primarily due to a lack of adherence to appointments by patients.

'... Most of the times I find you try and do an MUR... and it's got to be the busiest time of the day. A lot of companies have protocols [that say] oh make an appointment... Nobody comes back... and when you don't meet your targets you've got the grief from management that you're not reaching the targets, that's like to sell the services.' (CP12)

'The clinical services and medicines reviews... you can't really plan ahead, so yes... you can't plan too much of those.' (CP05)

CP12 talks about '*grief from management*' in the event that company targets are not met. This amounts to an additional pressure on top of the existing demands due to high levels of workload.

Repetition/automaticity

The repetitive and mechanical aspects of the dispensing process were associated with involuntary automaticity by four of the participants.

'Sometimes you switch off and you go into automatic dispensing mode until you realise God I'm going really quick and you try to slow down a bit but after fifteen or twenty minutes you go back [to the automatic mode]. It happens daily when... the place is busy or whatever and mentally you are really quick so I don't know, it's very difficult to prevent that to be honest. Probably with mental breaks for five minutes, but I think it happens to everyone.' (CP02)

Participant CP02 associates busyness and a faster working pace with impaired cognitive processes which then result in involuntary automaticity. *'But it's so easy to be mechanical and just get the prescriptions done and dusted and finished and not be seeing an error, yes there's huge potential for that.'* (CP11)

Participant CP11 suggests that efforts to complete workload under time pressured conditions may compromise the judgemental components of the dispensing process which are cognitive in nature. This may be due to the comparative ease of carrying out the mechanical components of the dispensing process which are technical in nature, as opposed to the judgemental components. She associates this fashion of working with a *'huge potential'* for error.

'And because of the sheer volume of prescriptions that you're doing, if you're doing 400 items a day, I think that's one every 45 seconds, then you've got interruptions, then you've got all the additional things... then you've got staff not of the right calibre, then you're not having enough breaks, then you've got this unconscious competence. You're on autopilot. So a lot of the time you can get it right but [eventually] you are going to make mistakes.' (CP04)

Participant CP04 makes reference to various aspects of working conditions in community pharmacy and associates these with involuntary automaticity. He suggests that whilst it is possible to correctly dispense prescriptions for a large proportion of time, on the basis of probability, errors are inevitable in present working conditions.

'But if we were all geared up and we are all firm... but we're checking so many things right after the other, sometimes this repetition becomes a routine... and I know they say well take a break, but we've already been down that road... but before you know it, it's trying to think... right, stop, walk away... come back [later].' (CP09)

Participant CP09 uses the words *'geared up'* and *'firm'* to express an effort to ensure accuracy in dispensing. However, despite efforts, the repetitive nature of the task may curtail the conscious attention given to the dispensing process so much so that it becomes a *'routine'* that results in error-promoting automatism. She also suggests that merely taking a rest break is not sufficient to avoid such automatism; rather a mental and physical break within the task is necessary.

Dispensary support staff

All interviewees commented on the levels and quality of training of dispensary support staff and how this impacted their practice and the management of workload.

Staffing levels

There was universal agreement amongst participants in this sample that staffing levels in community pharmacy had decreased over the years and at present were insufficient to meet workload demands. Three participants made reference to the period of time over which they had observed these changes.

'The staffing levels today to the staffing levels say in the year 2000, certainly there are less staff.' (CP04)

'I know that over the years, staffing levels have... over ten years staffing levels for the amount of work we do have decreased.' (CP10)

'I did go back to the same company about two years ago... straight away I noticed the difference from when I had worked there previously. And one those differences... [Was] staffing levels.' (CP09)

The decline in dispensary support staff numbers was reported to have taken place over the last decade or so. Participant CP09, who qualified as a pharmacist in 2010, associates the decline to the past two years. This may be because her late entry into pharmacy profession could mean that she has observed latter part of an ongoing decline which initiated before she became a pharmacist.

'There is always the staff problem, there's people off sick, and, quite often the managers are reluctant to cover sickness coz [sic] of the budgets' (CP05)

'I mean it is quite often that you find yourself on your own, quite often, it might be because I would hear the next day that somebody was sick or somebody just didn't bother turning up... and usually you don't get cover staff.' (CP03)

Unexpected staff sickness was reported to be one of the factors that precipitated staff shortages. In these instances, participants reported reluctance from management structures to provide additional cover staff due to financial constraints.

'But there's no excuse for it, pharmacies are extremely profitable businesses. The problem is that the employers choose not to give you the staff you need, it's as simple as that.' (CP04)

However, participant CP04 uses the statement *'pharmacies are extremely profitable businesses'* to pinpoint that reluctance from employers to provide additional cover is not due to financial constraints; rather it is a choice made by companies in an effort to increase profitability.

'You never get enough cover... so I was taking stuff home every night and I just thought oh sod this I'm not even interested in it.' (CP07)

Staff shortages mean that the workload that would have been shared amongst the pharmacy team now placed on the individual pharmacist. Participant CP07 expresses his frustration over staff shortages. Unmet workload demands due to inadequate staff cover, began to intrude into CP07's personal life as he was having to complete some work at home.

'If they've cut the staff and everybody is still trying to provide the same service. You cannot provide the same quality services with all the best will in the world... you try very, very hard and you've got to be professional and you've to be organised, but they [errors] still happen.' (CP09)

Participant CP09 identifies coping strategies that are employed to maintain an efficient service. These include *'trying very hard'*, being *'professional'* and being *'organised.'* However, despite *'all the best will in the world'*, she associated staff shortages to the poor quality of pharmacy services that the pharmacy provides and associated staff shortages to an increased likelihood to dispensing errors.

'Whilst I was a locum I did notice that there were some branches where there's only one staff member when there should have been three. And in those times there are a lot more errors. Definitely because one individual is doing the job of three people.' (CP05)

'Sometimes... you're on a relief and might only have one dispenser to cover the counter and the dispensary and if they're behind and so when people come in and it's not made up and then there's a mad rush to make it up on time and as quickly as possible and so there is the potential for errors to be made.' (CP07)

Eight of the participants felt that staff shortages were having an impact on the occurrence of dispensing errors in community pharmacy. This appeared to be an issue in particular for the freelance locum or relief pharmacists who work for short periods of time in a range of different pharmacies. Staff shortages mean that the workload per individual is increased, or that fewer individuals have to work at a faster pace to keep up with workload demands. Participants believed that these factors were associated with an increased potential for dispensing error occurrence.

Staff training

Issues around dispensary support staff training emerged as one of the most prominent themes in the present study, alongside issues with escalating workload. All participants raised a concern that dispensary support staff were not adequately trained enough to fulfil their role in the dispensary.

'If put my hand on my heart, up until the year 2000 I could go into any store and I would be happy with the calibre of the staff. I can't say that anymore. The calibre is very variable, the number of staff is very variable.' (CP04)

Participant CP04 identified that the issue of dispensary support staff training appears to be a relatively recent occurrence.

'The other thing which has changed is that if you go back to 1984, the dispensers used to do a City and Guilds course which was a two-year course and they would go into a university during the summer and they'd be taught how to make things extemporaneously; the calibre of those people was very high... 'What you find in recent years... there's one dispenser who will remain nameless, who passed the dispenser's exam, this was in [a large multiple pharmacy] and had never dispensed a prescription and no one actually noticed because it's just a tick box exercise.' (CP04)

'There used to be a two year course and now all the staff are suddenly being put on a 3 month dispensing assistant course, which they spend an hour in the dispensary dispensing and they call themselves dispensers. I don't know what's happened to the two year course... Yes I'd say suddenly that [staff training] has been really downgraded suddenly... ' (CP05)

Participant CP05 and CP04 both make reference to a dispensing training course of two years in duration which dispensers were required to complete in the past. Both participants suggest that the rigour of training that dispensers underwent in the past was of a high calibre. In reference to the recently emerging short dispensing courses, CP05 uses the rhetorical statement *'and they call themselves dispensers'* to make the point that modern training courses fail to provide training that can be considered fit for the dispensing role. Participant CP04 gives an example of an individual who was able to successfully complete the dispenser's exam without having ever dispensed a prescription.

'I've worked in places where you've got an ACT and you've got NVQ qualified [dispensers] and it is much smoother because people's knowledge levels are so much better, their accountability is so much higher... because they've got that commitment to their career, whereas where you're looking at lower than NVQ3, it's just a job really, the accountability is hardly there.' (CP06)

In some cases participants discussed about their experiences of working with poorly trained staff in comparison to more qualified staff. Participants identified that as well as aiding a smoother workflow, staff with higher qualifications demonstrated a higher degree of accountability and commitment towards their work.

'It's about having the right people to do the job... they would have to be able to self-check... be able to be work methodically, take responsibility for making errors, so producing accurate work, they have to care about what they're doing, they have to understand that it's a very responsible

job, that being accurate is the most important thing, they have to be able to take feedback and be able to work with a lot of different pharmacists often, so they have to be adaptable.’ (CP10)

Whilst other participants spoke generally about the calibre of dispensary support staff, participant CP10 highlighted some of the essential qualities that dispensing staff should possess in order to be considered fit for their role. These include accuracy of work, being able to self-check, accountability and taking responsibility for making errors, adaptability and being able to work in different environments or with different pharmacists, working in an organised and systematic manner, being able take feedback and, demonstrate enthusiasm towards learning.

‘I think... maybe look at the pay rates as well, because the pay rates that are given can sometimes... Well I suppose people with qualifications expect more pay and I think it is a demanding job and I think it is a very professional job at any level, even for the dispensers so I think there's got to be something... the pay rates for the pharmacists and the support staff, you know to attract the right people, with the right qualifications, the right calibre for the job, it's got to be the right pay.’ (CP09)

Participant CP09 highlights that the issue of inadequately trained dispensing support staff stems from poor pay rates for both the dispensary support staff as well pharmacists. She identifies that the role of dispensing staff is both demanding and professional. Therefore in order to attract the right people for the job, consideration should be given to pay rates.

‘You know I don't want to make one mistake in a week and yet some dispensers are quite happy to make two or three in a day, and I think well that's just too high really... OK maybe they are being picked up, but a little bit of bad luck... and we all know what ultimately can happen with dispensing errors, and people die, and like you, I just wouldn't want to live with myself knowing that that had happened.’ (CP07)

The majority (n=9/12) of the participants identified that inadequately trained staff posed as an important risk to the occurrence of dispensing errors in community pharmacy. Participant CP07 highlights that as a result of inadequate training, there appears to be cultural acceptance towards dispensing errors amongst dispensary support staff. Importantly, improving dispensary support staff training was the most commonly cited strategy to prevent the occurrence of dispensing errors in community pharmacy.

Distractions and interruptions

Ten participants spoke about distractions and/or interruptions in their work environment and discussed how these impacted their workload and the occurrence of dispensing errors. Whilst there was an acceptance that *'distractions have always been a part of community pharmacy'* (CP12), several participants highlighted that they had observed a noticeable increase in distractions over time, with *'more distractions now than ever before'* (CP12).

'If you're, if you've got someone waiting for a flu jab... then you're distracted. Remember there's always been distractions, someone waiting for a word and you're dispensing, so you're always doing two things, so there's always that. In retail there's always been a distraction. But there are just more distractions now, so it's just increased risk.' (CP05)

Participant CP05 associates the increasing prevalence of distractions to an increased risk of dispensing errors.

'... I say look we are not even left alone to check a prescription quietly, you've got a phone call, you've got some customer coming in wanting to speak to the pharmacist even for minor things because of the NPA advertisement 'Ask Your Pharmacist'... So something that a counter staff can do, but they [patients] ask for the pharmacist... So it is quite distracting actually.' (CP12)

'It's not about the number of items, it's about the number of distractions because you might only do 500 items, but if you were doing lots and lots of services that same pressure could be on in that particular time, depending on who is waiting and what they want for you to knock off and do.' (CP09)

The increasing prevalence of distractions in community pharmacy was associated with the increasing range of services that pharmacists are now providing and the advertisement of pharmacy services. Participant CP12 felt that due to the wording 'Ask Your Pharmacist' in the National Pharmacy Association (NPA) advertisement, patients were demanding the pharmacist's attention for relatively simple queries that a suitably qualified counter staff could provide.

'The most challenging things in my day is remaining polite and nice when actually I'm under huge pressure... On my gravestone I'm going to have 'I won't be long, this is only a tablet', you know that's absolutely... Having to be interrupted all the time, that is all the day and somehow I never have it that all of my workers have to do one job and finish it, I never have that luxury, I'm always being called to speak to somebody, check something, look at something, see and give out a methadone prescription, supply needles, it's just all the time, everybody is wanting you to do something. I think it's very dangerous.' (CP11)

Seven participants identified that having to work in a distraction-prone environment was the most challenging aspect of their working day. Participant CP11 highlights that she and her support staff rarely complete a task without interruptions. She also associates distractions with an increased risk of dispensing errors.

'Too many distractions, training up the people to understand that if I'm checking something don't interrupt me. Tell the customer the pharmacist will be with you in a few minutes, she's just finalizing her checks. It's just little things that can make a big difference.' (CP06)

Training support staff to avoid interrupting the pharmacist as well as maintaining discipline by pharmacists were identified as ways in which distractions could be managed. Participant CP07's comment suggests that a component of distractions may arise from an imbalance of conflicting workload demands which community pharmacists have an ability to control through disciplined and organised working.

'It just requires a lot of discipline and not talking and not getting distracted and things like that. So that's one thing and then I suppose, like I said it's just being able to balance these other conflicting or distracting things which we have to do.' (CP07)

Work pressures and stress

The majority (n=10/12) of participants spoke about increasing work pressures and stress. Of the remaining two, one participant reported that work pressures were increasing in community pharmacy. However, through disciplined and organised work, he did not allow himself to 'succumb to the pressure' (CP07). Whilst participant CP10 also spoke about various aspects of community pharmacy associated with increased work pressure she too reported that she herself did not feel pressurised. The source of work pressure was identified to be escalating workload, reducing staffing levels and inadequate staff training.

'I feel that it's [dispensing errors are] more likely to occur now than it was when I was a pre-reg four years ago and that is because of the amount of pressure that pharmacists are under. The pressure only comes with the more services that are there, that's only why the pressure is there. So the more we do, the more likely it is and I feel it is real, I feel pressured and I feel it is more likely that medication errors happen.' (CP03)

'I think it's the pressure and probably the pressure on the pharmacist... I think it is about pressure and it is about the workload...' (CP09)

Participant CP03 associated the work pressure to the increasing range of clinical services that are being provided.

'I've been stressed on a number of occasions, well it's basically the unreasonable demands placed on me and usually those demands are there due to an unwritten external agenda and just things taken to the nth degree.' (CP04)

Participant CP04 made an interesting suggestion. He expresses his frustration over increasing stress levels due to being subject to unreasonable workload demands that are beyond his capacity. He makes a reference to an '*unwritten external agenda*' to suggest an intentional subjection of community pharmacists and dispensary support staff to unreasonable levels of workload by large multiples in pursuit of financial gains.

'Well depending on how far we missed [the targets] and then they say oh you explain why... and then we tell them the reason and they say we've heard all this before, and you know is there any way you could do it... and things like that. You do feel quite pressurised meeting the targets, yes it's just... Well they'll just contact you like a business to be quite honest, not like before.' (CP12)

'The main pressure I feel are from the management of the company, so senior managers coming down with targets... I've been set targets, whether it is service targets or prescription targets or any other targets, I feel them pressurise me quite a lot.' (CP03)

Seven participants spoke about the target-driven culture prevalent in community pharmacy in relation to work-related pressure and stress. CP12's comment '*they'll just contact you like a business*' gives a sense of commercialisation of pharmacy services as viewed by senior management as opposed to patient care. Participants also highlighted that a patient-care driven approach taken by pharmacists versus a commercially-driven approach taken by pharmacy management towards the provision of clinical services is a source of conflict which adds to work pressure and stress.

'I don't know how it was previously, but from the way I look at it... I feel that it [the risk of dispensing errors] has increased from the way...

because I can tell you people don't intend to make mistakes, they do their best not to make mistakes, especially because they know the consequences, but sometimes with the workload and the pressure... yes, I think it [the risk of dispensing errors] is increasing, especially now.'
(CP08)

The majority of participants associated work pressures and stress to an increased risk of dispensing error occurrence.

'Generally over the years I've never felt very, very stressed partly because I've never allowed myself to feel it, not because I haven't been stressed because I think we've all been exposed to stress, but I haven't allowed the stress to get to me really.' (CP07)

However, participant CP07 suggests that despite being subject to increasing levels of stress and pressure, being able to cope with varying degrees of stress is necessary.

Corporate culture

Corporate culture was the third most noteworthy sub-theme that emerged from this study, after workload and inadequately trained dispensing staff. The interviews revealed three aspects of corporate culture that were a cause of considerable concern for pharmacists including conflicts between professional ethics and business-driven demands, patient safety, and the health and safety of pharmacists.

Professional ethics

Participants expressed their frustration over having to sacrifice professional ethics over business-driven demands from managers and employers.

'Well I think most people sort of, just sort of get on with it. You can't not get on with it because you can't say anything to management, they're not going to (laughs) do much. You know well... it's... I think it's been in the press a lot, you get graded and get targets. If you say anything you won't

get a pay rise, so you just get on with it, but I mean I'm 48, so I suppose I don't, I'm tailing down now, I don't do the hours I used to, so I don't tend to want to upset the boat and say much, so I just get on with it.' (CP05)

Participants expressed that they were unable to voice their concerns in order to avoid hostility from the managers/employers.

'It's the people that are above that you will tell you something that is contrary to what you want to do, but thankfully, I'm strong enough to say I'm not going accept that... But not everybody has the conviction to do that.' (CP06)

However, some participants (n=3/12) were able to abstain from and object to the unreasonable demands from managers/employers that they felt were challenging their professional ethics. CP06 points out that not all pharmacists may have the strength in character to do so.

'But obviously when the manager is there or a dispenser that I know will report me to the manager... I try to be... you could I say I try to be a bit more diplomatic in a way. [So I say to the patient] 'ah, so you're taking aspirin? Everything all right?' So I do it... so that I do not have do an MUR, but [instead] I tend to do it as if I'm whispering to the patient so that they just go, go.' (CP08)

However, a majority of participants discussed that they were unable to directly challenge their managers/employers when asked to do something that they felt was inappropriate. In the quote above, participant CP08 refers to times when she feels pressurised to conduct an MUR on patients that she considers unnecessary. She highlights the use of diplomacy to balance professional ethics and the target-driven approach taken by managers/employers towards the provision of clinical services.

Patient safety

Participants frequently spoke of the business-driven approach towards the provision of pharmaceutical and clinical services as compromising patient safety.

'It's become more about money and targets than it is about patients. It's just too much pressure from the companies themselves, there's a lot of fear and pressure that if you don't perform the way they expect you to perform, then you're going to have somebody come down. And I don't think that is very nice.' (CP06)

Participant CP06 highlights a culture where financial gains are prioritised over patient safety. She goes on to speak about improper/incomplete checks on prescriptions in some of the larger multiples.

'And you will find that some of the pharmacy multiples, especially the big ones, will not do proper full checks like we do expiry dates, form, and ticking things. They won't do it, because it takes longer.' (CP06)

Similarly, CP08 talks about an expectation from her employer/manager to breach SOPs in order to complete a high workload.

'When you are in practice nobody talks about the SOPs, or they [manager/employer] say... 'o yes if we do this... if we do that, we will never finish our work, will never be able to do this....' (CP08)

Participants expressed their frustration over employers/managers laying the onus on pharmacists in the event of an error.

'But unfortunately when mistakes do happen, you will be blamed for not following the SOPs.' (CP08)

Participant CP08 conveys the vulnerability of pharmacists in the present corporate culture. Whilst employers/managers expect pharmacists to deviate from the SOPs in order to meet workload demands, in the event of an error, the employers/managers use those SOPs to lay responsibility of dispensing errors on pharmacists. CP05's statement *"at the end of the day if anything happens, it's me, it's my fault, not theirs..."* also highlights the vulnerability of pharmacists and suggests that employers/managers should also share responsibility for dispensing errors for subjecting pharmacists to poor working conditions.

Health and Safety of Pharmacists and support staff

Most participants spoke about various aspects of health and safety in the work place. Discussions were focussed around four key areas: a lack of rest breaks, long and unsocial working hours, and physical exhaustion.

'I think it was the long hours, lack of breaks and lack of seating. The actual physical exhaustion.' (CP01)

All participants spoke about a lack of rest breaks with one participant stating that since he does not have rest breaks, he *'wouldn't really know what it's like...'* (CP03). Participants expressed their frustration over implicit, and in some cases explicit communications from companies preventing pharmacists from taking rest breaks.

'No breaks. I was told nobody takes a break. No breaks? In a nine or ten hour shift? I was absolutely horrified...It wasn't until some point later that I said in an [supermarket pharmacy] store I'm going to the consultation room! And actually the first time I did it, I literally went in there and slammed the door. I'd just had enough! It was like I'm either gonna have this twenty minute break or I'm going home! You know... I've had enough! (Laughs) and actually their mouths dropped...' (CP01)

'Now there's an expectation that you work all day long, that you will not have break. All pharmacists are effectively compelled to work through the lunch hours, so you work usually a nine hour day.' (CP04)

'Usually they [the company] don't want you to take more than ten or fifteen minutes for lunch with no rest breaks.' (CP02)

Participants in managerial positions tended to take breaks in accordance with the needs of the business, which due to high workload levels meant that often, they were not taking any breaks.

'I don't always have a break... I mean this is me (the interview) sitting down. Usually... often in a day the only time I sit down is when I go to the loo.' (CP11)

Long and unsocial working hours were considered to be a safety issue for some (n=5/12) participants.

'I only worked part-time of safety reasons, I would have loved to have had the money from working full-time but I didn't feel professionally it was safe for me to work like that.' (CP01)

Participant CP01 goes on to describe the physical exhaustion that she experienced due to long working hours in poor working conditions. Her recognition of professional responsibility coupled with a fear of making a dispensing error ultimately led to her decision to leave the pharmacy profession.

'I just didn't have that energy to work a long demanding shift in bad conditions, and then go in and do the same again the next day, five days a week for you know forty hours, I just needed a lot more time to recover, I'd found it would take me a whole day to recover from some of my shifts, seriously, you know... it was... that's why I've left, I now have a full-time job, not in pharmacy, which is fine, I'm perfectly fit and able to do that work full-time but I couldn't do it in a pharmacy or not in the majority of them... it would just be dangerous...coz [sic] I used to worry a lot, you know I really did worry a lot, we do have a big responsibility.' (CP01)

Participants also spoke of longer working hours in community pharmacy due to extended pharmacy opening hours.

'What's happened in some stores in this locality, particularly some of the city centre stores, they're now open extended hours 8am till 6pm, so the pharmacist working there will be working a 10 hour day, so that's a 50 hour week. Now I'm an experienced pharmacist, I would say in that shop it would be unsafe to do that.' (CP04)

Three participants spoke about the use of performance contracts by some of the large multinational companies as a way of compelling pharmacists to work extra hours above their normal paid working hours.

'I often find that... pharmacist are expected to work longer than their hours... in some companies like the last one, the big multinational, it was expected of you... the way they measured you was performing, not performing or excellent, you know to get anything like excellent they expected you to be doing extra hours above your normal day.' (CP09)

All three participants considered performance contracts as compromising patient and pharmacist safety by indirectly driving pharmacists to work longer working hours.

'It is described as the 'stretch and extract' system of management, where you stretch the staff as far as you can and you extract the maximum amount of money... Now what you see, the owner of [a large multiple pharmacy], he has gone from the 499th richest person on the planet to the 99th in ten years and how has he done that? By simply 'stretch and extract', which is wrong.' (CP04)

Participant CP04 makes reference to the 'stretch and extract' system of management, which he says is used by some of the larger multinational companies. Other participants also made reference to a culture prevalent in some of the larger

multinational companies which subject pharmacists to exhaustive levels of work in order to maximise profits for the company.

'As a locum, I spoke to a lot of pharmacists and I am aware that others have had breakdowns..., young pharmacists who have had breakdowns because of working conditions, which I found deeply shocking, I mean you know... like twenties and thirties.. they should be in the prime of their profession, I didn't used feel like that when I was in my twenties, thirties or forties (laughs). You know working as a pharmacist before things got awful, I don't think it's all because of the new contract, I think it's to do with the multiples just caring about profits and nothing for us really. That's how I see it.' (CP01)

Whilst around half of the participants alluded the worsening working conditions to the corporatisation of community pharmacy, participant CP01 made a clear distinction that the community pharmacy contractual framework was not the primary source of present working conditions. Rather a corporate culture in community pharmacy where pharmacists are viewed as a 'disposable resource' (CP04) was articulated as a key concern for pharmacists, threatening the professional status of community pharmacy.

Lack of response from the regulator

A third of participants expressed their disappointment over the lack of response from the GPhC, the pharmacy regulator, to the current working conditions in community pharmacy. Participants felt that the Royal Pharmaceutical Society and the GPhC '*lack the teeth*' (CP04) to address the problems faced by community pharmacists and are not '*much use at all*' (CP11) in publicising the role of the community pharmacist.

'I think a big part of it is that you've got the GPhC and the Pharmaceutical Society, and I can't believe that they're not aware of the problems, but they choose not to do anything, so they choose not to do give us any help whatsoever and I think that's a terrible indictment of pharmacy.' (CP04)

He goes on to identify the underlying cause of deteriorating working conditions in community pharmacy to be an effort on the part of pharmaceutical companies to maximise profits at a time of reduced government funding for pharmaceutical services.

'But the reason for it is simply greed, it's greed by the companies, and it's the society or the government not being prepared to fund the services that people want.' (CP04)

Summary of theme one

This theme has highlighted various aspects of working conditions in community pharmacy, and the perceived impact that this has on patient safety, specifically the occurrence of dispensing errors. Escalating workloads, both in terms of prescription volumes and the provision of a greater range of clinical services means that pharmacists are having to multi-task, often with increasing levels of distractions and interruptions. A business-driven approach towards the provision of pharmaceutical services and patient care, and a disregard for the health and safety of pharmacists and pharmacy staff by managers/employers, particularly in some of the large multiples were identified as key sources of stress and work pressure for community pharmacists. Of particular importance is that participants perceived that patient safety was compromised, with an increased likelihood of dispensing errors occurring in present working conditions.

5.5.2.2 The role of the community pharmacist

The second theme that emerged from this study was the role of the community pharmacist. Discussion about this theme centred around five key areas: patient expectations and public perception of the role of community pharmacists, dispensary support staff understanding of the role of the pharmacist, professional autonomy, pharmacist's opinions about their job/profession, and present and future plans of community pharmacists. Each will now be discussed.

Patient expectations and public perception of pharmacists' role

Nine of the twelve participants spoke about work pressures arising from unreasonable patient expectations in relation to the supply of medicines and the provision of clinical services. The majority of participants identified that '*unmet expectations*' (CP01) of patients stemmed from commercialism and advertisement of pharmacy services.

'So the public perception, what the companies advertise is different now to what they provide. Whereas five or ten years ago, you could go straight out and talk to someone and give their prescription out straight away you can't now, so there is a conflict.' (CP05)

Raised patient expectations was associated with increased pressure on pharmacists to provide a faster service in the absence of the resources necessary to do so, thereby compromising the quality of services being provided.

'They [the companies] raise people's expectations to expect a fast service and there's a pressure to do a fast service... but fast doesn't always mean good and they don't give you the resources to do a fast service...' (CP01)

Raised patient expectations coupled with a lack of appreciation of the role of the pharmacist by dispensary support staff ultimately leads to a culture in community pharmacies that disregards patient safety by compromising the quality of pharmacy services.

The only thing that I got criticised there for was I insisted on handing them [the prescriptions] out and counselling them [patients] and they [dispensary support staff] said well the other pharmacist never used to do that... and I said well I'm not the other pharmacist... and they said you're slowing us down ... as far as I'm concerned that's a part of the job otherwise it would just be supply... you might as well get some sort of monkey to hand it out.' (CP07)

Participants felt that *'the expectation of customers' needs to be set right, right at the beginning'* (CP06) in terms of the waiting time for prescriptions and services. Often, participants expressed that patients should be prepared to wait for pharmacy services in the same way that they are prepared to wait for their GPs, and other health professionals.

'I don't think waiting half an hour for a service would be unreasonable as I don't think it would be unreasonable to wait for a prescription. Patients always have a choice to take it elsewhere if necessary. We always wait far longer for GPs and hospital appointments than half an hour, so I just don't think it's unreasonable... I don't see that that's a problem.' (CP10)

Participants also expressed feelings of isolation and a lack of support from employers when patients put forward a complaint.

'People are encouraged to speak to pharmacist more, there's an expectation that you can walk into the pharmacy, interrupt the pharmacist at any point in time and get an answer straight away. Patients are certainly ruder than they were in the past, they're more eager to complain than they were in the past, you certainly don't have the support that used to get in the past.' (CP04)

Five participants made comparisons of patient expectations of pharmacists with patient expectations of surgeons and doctors to highlight the significance of the role of pharmacists, which participants felt is not always appreciated by patients.

'I think that there could be a lot more understanding... you know what the public expect... they want it right but they want it quick. You wouldn't say to a brain surgeon 'oh he's a very good brain surgeon and he's so quick', you know speed is what they want...' (CP11)

Participant CP08 associates the increasing range of functions of the community pharmacist with a lack of understanding of the distinct role of the pharmacist.

'So I think by time we are starting to lose the understanding of the role of the pharmacist and expecting them to cover everything and be responsible for everything but at the same time they have the legal responsibility if anything goes wrong.' (CP08)

Participants felt that pharmacists hold a critical position in the patient care pathway. However, a lack of understanding of the role of the pharmacist coupled with demanding and impatient patients, can potentially increase the likelihood of dispensing errors.

'But sometimes I don't think there's an understanding out there of how important it is to realise that we are the last port of call. If something goes wrong, we could have prevented it... and you've [the patient] just pushed for that pharmacist to just give you whatever you want and that could have been your child's life.' (CP06)

Staff understanding of pharmacists' role

Whilst the issue of inadequately trained staff was a key sub-theme in this study, some (n=3/12) participants specifically spoke about a lack of understanding or appreciation by the dispensary support staff of the role of the pharmacist. This was attributed to poorer staff training and a lack of experience due to a high turnover of dispensary support staff.

'We can't really lie about it, I mean the dispensing training as I've mentioned has been changed. There's a lot of new staff... The staff turnover is very high... They're not experienced enough... I'm being negative here (laughs). Well it's what's happening, yes it's just all negative isn't it? They don't always fully understand your responsibilities... So the risk [of dispensing errors] is obviously going up because of the training and the services.' (CP05)

Participant CP08's quote articulates the tension that arises as a result.

'But sometimes if you have less experienced people, unfortunately even if they try to help they can't... there are some certain members of staff, they tend to have... I don't know... they see the pharmacist as a threat... I have this feeling... there is this bit of clash between either technicians... it's just a feeling, but sometimes some members of staff tend to give you this impression that you're just signing [so] why are you saying I can't do it now? I think that's where the pressure comes from.' (CP08)

Participants identified the importance of the pharmacy support staff to understand that the pharmacist taking time to check the suitability of the medication is an essential step in ensuring patient safety as well as avoiding a build-up of negative atmosphere in the dispensary environment.

'The second thing is making the team understand the role of the pharmacist, hopefully (laughs) and understand that if the pharmacist is taking his time to check the age or the suitability of the medication, that time should be respected, it shouldn't be created into a negative atmosphere that you are taking too long, and probably, sometimes understand that the pharmacist has the right to refuse to provide a certain service... because sometimes this is not well understood and creates such a negative impact.' (CP08)

Professional autonomy

Most participants (n=8/12) recognised that their professional autonomy had become increasingly compromised as a result of increased workload, corporatisation of pharmacy, and a lack of appreciation of pharmacists' decisions by non-pharmacist managers.

'It's just simply wrong. You want someone to do the job to the best of their ability. You want someone to make the best decisions for me as the patient.' (CP04)

'The problem I think sometimes is, you can be tired and it's up to you to professionally say, no I'm a little bit too tired, I need to step away, I need to take a break, but sometimes you can't see that... you get past that stage when you may be tired...' (CP09)

'I don't feel like I've let myself become stressed, coz I feel I use my professional autonomy, as I see it, to regulate what I do.' (CP07)

Participants felt that current workload demands are '*simply wrong*' and can impact the decision making of pharmacists (CP04). Participant CP09's quote illustrates how going beyond a threshold level of workload can impair the ability of pharmacists to exercise their professional judgement in relation to their ability to perform the task at hand. Participant CP07 was one of the two pharmacists who felt that, despite being exposed to increasing levels of work pressures and stress, he did not allow himself to become stressed. He identifies the use of professional autonomy to regulate his work needs as the determining factor in avoiding stress.

'If you say anything you won't get pay rise, so you just get on with it, but I mean I'm 48, so I suppose I don't... I'm tailing down now, I don't do the hours I used to, so I don't tend to want to upset the boat and say much, so I just get on with it.' (CP05)

Corporatisation of community pharmacy was also identified as a threat to professional autonomy. Through the use of performance contracts by some of the multinational companies, some pharmacists felt their professional autonomy was challenged. Participant CP05 feels he cannot articulate his concerns in fear that he may '*upset the boat*' if he does so.

'Every single store had a non-pharmacist manager and that's where a lot of the problems come; that they're not pharmacists and there's a lack of understanding.' (CP04)

'It's the people that are above you will tell you something that is contrary to what you want to do.' (CP06)

'And then you have to explain to the manager why you know I refused to sell it. But you can't do it too much otherwise the management... they be like... you are being over cautious because they don't see it like how a pharmacist sees it.' (CP12)

Participants also expressed their frustration over a lack of understanding and appreciation by non-pharmacist managers of the decisions that pharmacists make. Some participants felt that they were pushed by non-pharmacist managers to sell drugs or get involved in some of the business aspects despite the pharmacist considering it unnecessary. Participant CP08's quote *'this business aspect... I understand if other members of staff do it, but you are expected as a pharmacist to get involved'* illustrates an example where pharmacists may have to compromise their discretion in order to comply with expectations from the managers/employers.

Opinions about their job/profession

Throughout the discussions, ten of the twelve participants reflected upon their experiences in community pharmacy and gave opinions about their level of satisfaction with their job/role. Whilst most participants found the provision of clinical services and patient contact a professionally rewarding aspect of their role, escalating prescription volumes coupled with a range of different clinical services was found to increase stress and work pressure, reducing job satisfaction.

'The pressure only comes with the more services that are there, that's only why the pressure is there. So the more we do, the more likely it is and I feel it is real, I feel pressured and I feel it is more likely that medication errors happen... I've noticed that the job satisfaction has gone down from over the years mainly because of the pressures that the companies are putting on the pharmacist. So I'm not terribly happy in the way that my job is and the way that it's going or the future, no not very happy.' (CP03)

'But over the years, when I first started in the profession, I really, really enjoyed the job, there were pressures but we could cope with it because the added services that were expected weren't as many as they are now.'

(CP06)

Participants who had been in the profession longer reflected upon how they had observed community pharmacy change over the years. The key point raised by these participants was reduced patient contact at present compared to the past. Participant CP12 clarified this concept further by identifying that due to escalating levels of workload and reduced patient contact, ultimately the situation in community pharmacy has come to a stage where *'passion and care is taken out of the equation'*.

'I think even the young ones I talk to, they've graduated and they are in their prime time... they find it hard as well, just because of the pressure of work, the amount of work they have to do... I used to be able to talk to the customers, you know them... but now you give out the medications, do your services, do your paperwork, that's it, there's no care, no passion at all... Before that I loved my job until five years ago, and now looking at all this paperwork and targets I just don't envy anybody doing it.'

(CP12)

'The job is so different to what it used to be, so much more relaxed and we used to have right laugh and look after the customers and you don't now. It's changed.' (CP05)

On the other hand, younger participants spoke about a misalignment of their undergraduate degree programmes and level of training they had received at university with their actual roles.

'Pharmacists went into pharmacy probably thinking there would be more than just the dispensing aspect and along the way they found that yes there are a few more services but it hasn't developed perhaps as quick as the universities told them that it would develop...' (CP03)

Younger participants felt that role expansion from a predominantly supply function to a more clinical and health promotional functions was developing at too slow a pace, which meant that participants viewed a reduced potential in community pharmacy, which too acted to diminish job satisfaction amongst the newly qualified pharmacists.

Present and future plans of community pharmacists

Seven participants spoke about their present or future plans in community pharmacy. One participant had recently left the pharmacy profession at the time of the interview, one had made arrangements to move on to a different sector of pharmacy, three were heading towards retirement, two of which were looking to retire early, and one was unable to work full-time in community pharmacy and so had pursued part-time employment.

'And actually one of the other reasons I am leaving is also my own personal health... not only is it living with the fear of killing somebody because of poor working conditions but it's also what it's doing to me... you know my anxiety levels are building and that's not healthy, it's not healthy for any part of me, and also all that standing without being able to sit down, it's enough to make your legs ache, that's not healthy either.'
(CP01)

Participant CP01 left the profession due to *'horrible working conditions'* which compounded to her developing a fear that she may make a dispensing error which may kill a patient. Another reason for leaving the profession was the impact that present working conditions were having on her physical and mental health.

'I'm looking forward to getting out I've planned my... I'm 48 I'm now planning on 55, I'm sort of going I'll be getting out by then coz it's getting so busy, so yes I'm not as happy as I used to be.' (CP05)

'I just wouldn't start again with community pharmacy because I think the model is so flawed in so many ways.' (CP07)

Participants CP05 and CP07 were both considering early retirement due to reduced job satisfaction.

'Yes you know and I was saying to my other half the other week, I think this is a young person's job because the workload and the pressure and all the checking... when I go home I'm really tired and I go and lie and go to bed early, coz I think I've got to get up tomorrow... would I be better if I was like 26 or 27? You know would that be better or would it have just been the same?' (CP09)

Similarly, participant CP09 reflected upon the physical and mental demands of her job and considered it too challenging for her age (58 years).

'But obviously I mean if I was working full-time or if I was the manager of the store, it would be mad, I wouldn't be able to manage the pressure, but just because I'm a part-time pharmacist... I will be... I think I will be a part-time pharmacist for quite a while now, I'm not thinking of becoming a full-time pharmacist at all, at least I'm not thinking of becoming a manager or anything as such because it would definitely affect my life, yes definitely.' (CP08)

On the other hand, of the two younger pharmacists, one had considered moving onto hospital pharmacy (CP03) whereas the other considered that full-time employment would be too challenging for her due to work pressures, and would have an impact on her life. Moreover, Participant CP08 highlights that by working part-time, she allows herself time to recover from the exhaustion that she experiences during the days that she works.

Summary of theme two

Pharmacists perceive that patients do not have a good understanding of the role of the community pharmacist, and that patient expectations had been raised due to advertisement of pharmacy services. This coupled with a perceived lack of

appreciation of the pharmacist's role by dispensary support staff compounds to rising tensions amongst the pharmacy team, and pressure on the pharmacist. Corporatisation of pharmacy and commercialisation of pharmacy services was perceived to undermine the pharmacist's ability to exercise discretion where they see fit. These factors along with poor working conditions and slow developments in the role expansion of community pharmacists produce feelings of reduced job satisfaction, with some pharmacists considering leaving the profession or pursuing roles in a different sector of pharmacy.

5.5.2.3 Experiences and attitudes of community pharmacists towards dispensing errors

Participants spoke about their feelings and attitudes towards dispensing errors as they reflected upon some errors that they had made. The discussions were focussed around four key areas: potential for making a dispensing error, feelings after or about a dispensing error, impact of the dispensing error on the pharmacist and the prevention of dispensing errors.

Potential of making a dispensing error

The discussions about the potential of making a dispensing error were based around two key themes; the likelihood of a dispensing error occurring and the attitudes of pharmacists towards the potential of making a dispensing error.

The majority (n=10/12) of participants perceived that the risk of dispensing errors in community pharmacy is increasing, whilst two pharmacists (CP07 and CP10) felt that there had been no change in the potential of making a dispensing error. Interestingly, both pharmacists that perceived no change in the risk of making a dispensing error were also the only two pharmacists that reported they did not feel stressed despite being exposed to higher stress and work pressures. These were also the only two participants that made reference to managing workload demands and coping with pressures by using their professional autonomy to regulate their practice.

The majority of participants felt that, due to the human error component, the risk of dispensing errors was inherent in community pharmacy.

'It's very easy as a pharmacist to just simply get it wrong, just to misread things because we're human.' (CP04)

'There's always potential for making a dispensing error, we are all human, we make errors.' (CP10)

'I think some of them [dispensing errors] at the end of the day are going to be the spur of the moment and could happen.' (CP09)

All participants took the occurrence of dispensing errors very seriously and viewed the dispensing errors in terms of the impact that they can have on patients.

'And if that's only one mistake in 10000, that is one too many.' (CP04)

'It's not medications, it's the patients taking the medication.' (CP08)

Most participants felt that the potential of making a dispensing error was greater now than it had been in the past and associated this to a higher workload, faster pace of work and increasing level of distractions in community pharmacy.

'Huge potential, huge potential! In fact I'm amazed that we don't make more, I'm absolutely amazed at the pace that we do.' (CP11)

'Sometimes a bit too many things are happening, it is no wonder mistakes can happen... Very high [potential of making a dispensing error] sometimes. I made an error here, I'm telling you I hardly ever make a mistake, hardly ever, but it's happened.' (CP02)

'I would say that now there's a much greater chance of a mistake being made now than at any other point in my career. I would have thought that pharmacists setting out now... the chance of them making a serious mistake is measurable and that is unacceptable.' (CP04)

Two participants spoke about a higher incidence of near-misses occurring throughout their work.

'The number of near-misses you see, it's not uncommon to see 4 or 5 near-misses a day.' (CP04)

'I tend to find we have a lot more near-misses rather than actual errors.'
(CP10)

For some participants the increasing potential of making a dispensing error left them feeling scared and anxious. These feelings had the greatest impact on participant CP01. The quote below describes her thoughts about the possibility of making a dispensing error and how this influenced her mental and physical health and also her career.

'It worried me. That is... I mean... I hope I don't cry... but yes... It was an awful anxiety and I don't think that that anxiety has totally left me [cries] yes... Sorry... and that's why I'm not working in pharmacy [sobbing]... It just frightened me as I'm getting older that I might make an error that would kill somebody [sobbing]... I just didn't want to do that [sobbing]... I thought I couldn't live with myself [sobbing]... I'm a Christian lady and I used to pray before I go to work every day, please God let my dispensing be accurate, everything I'm responsible for, I thought if I give enough advice it would just [unclear speech in the cries]...' (CP01)

Participants acknowledged the burden of responsibility that they hold in their position as a community pharmacist and were apprehensive of the potential for patient harm arising as a result of a dispensing error. Some participants had decided that ultimately in the event of significant harm to the patient, they would leave the profession rather than continue working. Participant CP06 identified in the quote below that failures in the present model of community pharmacy have resulted in pharmacists having to make difficult decisions about their careers.

'From a very early time, I've realized that if it's beyond my power, and if something has happened, I would just give up my job rather than carry on once I've hurt somebody and that's caused such a big problem... And you just think to yourself that there must something wrong with the system that you get to that place, where your career could be on the line and nobody seems to be realising that we should have something else in place to prevent us having to feel this way... if it can happen to one pharmacist, it can happen to anybody.' (CP06)

Participants also spoke about the fear of consequences being one of the reasons why pharmacists try their best not to make errors.

'I can tell you people don't intend to make mistakes, they do their best not make mistakes, especially because they know the consequences.' (CP08)

Impact of a dispensing error on the pharmacist

Discussions about potential dispensing errors or errors that participants had made revealed strong and, in some cases, lasting emotional and psychological responses. Participants reported feeling upset, shocked, fearful, angry, guilty, anxious, sick, nauseous and some had trouble sleeping.

Some (n=4/12) participants reported that one of the immediate responses was anxiety-induced nausea and fear.

'Sick every single time' (CP11)

'When you find out it's really, it hits you right in the stomach, it really makes you feel physically sick, and you know... it's like a horror feeling.' (CP09)

'You always feel sick.' (CP10)

Other participants expressed feelings of shock, anger and guilt.

'Oh terrible, oh terrible! Terrible! It's the most... how could you possibly do that? How could you possibly do whatever you've done? Well actually it's a miracle it doesn't, it's an absolute miracle that it doesn't happen more often. Yes I feel terrible... but sometimes I feel less guilty when I know no harm has been done.' (CP11)

'I mean myself after 34 years, if I make a mistake even now, the impact it has on me, it's a bit like stepping off a curb and the car has missed you. That's how I feel after 34 years.' (CP04)

Participants reported feeling upset and fearful of the consequences to the patient and any disciplinary action taken against the pharmacist.

'I hate making errors, always hated making errors, feel upset obviously... worried about the consequences for the patient... worried about the consequences of any action taken against you.' (CP10)

'The dispenser was really, really upset, she cried... you know she thought: A) because the person's got the wrong thing; and B) because how could I make a mistake like that? I'm losing the plot you know, I'm losing the ability to do my job, so it's not just what it's done to the patient, it's a measure of how you've done your job.' (CP11)

Participants also reported feelings of worry and insomnia that could last from a week to months.

'I can remember some from some time ago... some that still keep you awake at night....' (CP10)

'You worry about them at night, you probably wouldn't sleep at night, yes definitely, of course if you're a professional. It's not...' (CP11)

'I was worried for a few months, I was worried for a good a few months.' (CP12)

On a psychological level, participants reported that the occurrence of the dispensing error had led them to doubt their abilities and dented their confidence.

'If it's a big error, I'm really scared and then my confidence goes, which happened once some years ago.' (CP12)

'Really shook me up... It was tough, I was not confident, I did not tell anybody what had happened, I just said, you know I said a prayer before I walked into the shop and took a few deep breaths, got on with the work in my normal way that I would, didn't actually, I think I was a bit quiet if I remember rightly, coz I didn't want to get too chatty... coz [sic] I didn't want you know anything to slip out about what had happened.' (CP01)

'I'm thinking my God it's time you stop doing this, it does make you doubt yourself.' (CP11)

'You are lost in your thoughts... you have a mental backlog...you think in a retracted way... Why am I here? Should I be here? How can I get out of this problem? It's a bit unfair, but what can you do?' (CP02)

However, for some participants, the impact of the dispensing error on self-confidence had a short-term impact. Participants also sought support from other pharmacists by sharing their experiences with them.

'I'm a quite a strong person, so it doesn't bother me for long, I can rise above things and usually you know I have various ways of thinking about things... talking to another pharmacist or sharing it...other pharmacists are very supportive in this situation.' (CP11)

Impact of the dispensing error on personal life

For some participants, the occurrence of the dispensing error had an impact on their personal life. For one participant (CP01), the occurrence of a dispensing error left a long-term impact on her physical and psychological health and well-being. Similarly,

the occurrence of a dispensing error had a considerable impact on the relationship of CP06 with a potential partner that eventually led to them breaking up.

'Personal life wasn't good. I was actually with somebody at that stage that didn't quite understand the extent of the responsibilities of my job... So I was very, very distraught on the day [I found out about the error] and they rang me up at home... I was on my knees praying that this lady [the patient] would be fine, and I was in tears... Obviously the guy I was with, he just tweaked oh my gosh, it's such a responsible job, and what... we were going out like a year or something, and I was just flooding and I just thought... how on earth could I have done that, how could she have taken out the wrong thing and I didn't notice it? You're distraught for a long while afterwards... And I actually broke up with that person...' (CP06)

For other participants, whilst the impact of the dispensing error was not as momentous as that of participants CP01 and CP06, feelings of upset and worry kept them thinking at home and in their personal time.

'It changed my personal life in the sense that I went home and I told my wife. I was a little bit upset when I got home you know, how could you have made this error? Look at what could have happened? So yes it did affect.' (CP03)

'When you go home it's on your mind and you might be sat there that night and you might still be thinking about it, it's like a really strange thing.' (CP09)

In some cases, participants had to give up their personal time to gather information about the error, to contact patients and be prepared in case of disciplinary action. For participant CP08, this became a point of realisation that she could not work full-time in community pharmacy as it would be far too demanding and exhaustive. Participant CP08 feels that by working part-time, the dispensing error did not have a substantial impact on her personal life as she was able to use the days off as time to recover.

'It didn't affect me, much my personal life because as I say I had time to recover [due to part-time working], but it made me come to work on my days off because I was so scared... So during those days I was just trying to gather as much information as possible just to cover myself you know, just to make sure in case anything happens, at least I would be able to say no I did this, I checked this, and I did that... and then they can make their decision. But then I realised that there is no way I would be able to work as a full-time pharmacist with [a large multiple pharmacy] (laughs), no way!' (CP08)

Impact of the dispensing error on the pharmacist's practice

As mentioned previously, the occurrence of the dispensing error had an impact on the confidence of most participants. This led to most pharmacists exercising greater diligence in their work, slowing the pace of work and performing more checks.

'Makes you slow down, it makes you double check things more.' (CP11)

'I think it refocuses the mind.' (CP10)

'If you make one mistake, you actually you take more care, you slow down, you look at the way you're checking things and the things that you do.' (CP04)

For a minority, taking extra caution in their work led to a stage of paranoia due to excessive checking.

'It worried me, you keep on switching back until the whole thing has settled down, and even after it has settled down, they [support staff] say, 'oh you're paranoid' and I say 'oh yes I am because I made that mistake'.' (CP11)

'I think my energy levels were badly affected the first week so I had to really, really rest a lot and make sure my concentration was there, triple checking everything, so I think you get to a paranoia stage. I just had to

go in calmly, I did get over it in a couple of days, but you still have that in the back of your mind.' (CP06)

Two participants articulated the difficulties they experienced in having to get back to work immediately after the error. In the case of participant CP08, she expresses the difficulties of having to investigate the error and maintain the running of the dispensary. Participant CP09 however, refers to the recurring thoughts of the dispensing error impeding her ability to continue performing tasks required of her.

'So I think it's unrealistic from the clinical governance pharmacist to expect us to stop completely dispensing and to deal with that [dispensing error] because it means that we will close the pharmacy down.' (CP08)

'But at the same time you're at work and you've got to carry on doing what you're doing, but you know that your mind is just thinking about that all the time, you know... What happened? What went wrong? How did it happen?' (CP09)

The occurrence of the dispensing error was also a source of learning for a majority of the pharmacists.

'I think making an error in my experience makes you careful, so I think if you make an error you don't make one the next day, tends to be my experience...' (CP10)

In most cases participants identified the importance of adhering to the SOPs.

'I think those SOPs are there for a very good reason and of course it does make it safe and even with good working conditions but I think they're good with the benefit of hindsight, but yes it's breaking a habit isn't it? I adhere to them to the letter now (laughs). That was a big learning experience for me.' (CP01)

In some cases participants relocated the items that had been involved in the error, or highlighted items that there were involved in the error through the use of stickers on shelves, on prescriptions, or flash up notes on the dispensary software.

‘So you do take a step back and have a look, and make as many shelf stickers or flash up notes on the system.’ (CP09)

‘So there are a lot of steps I’ve put in place, relocation of items, how we do white boxes and how we label them up so we do a mental check and the highlighting of the prescription.’ (CP06)

A majority of participants identified that other than exerting greater caution in the work, and carrying out more checks, they could make no changes in the dispensing practice or process. However, participant CP05 highlighted that the impact of the dispensing error eventually wears away, and due to the busyness of the work environment, you revert back to your original practice. *‘You’re very careful to start with, but you’re so busy you, yes you just go back to normal. That’s what I think.’ (CP05)*

Error prevention strategies

Discussions about strategies to prevent the occurrence of dispensing errors in community pharmacy identified five key areas of improvements; workload management, staffing levels and training, managing patient expectations, managing distractions, and ensuring sufficient and regular breaks. However, it is of note that a third of participants also considered and accepted that the risk of dispensing errors is inherent in the pharmacy profession.

‘At the end of the day, there is some risk in this job and you have to take it.’ (CP02)

Managing Workload

Participants identified that management of workload was essential to prevent the occurrence of dispensing errors.

'It's about managing that workload and making sure that it's built into your daily processes.' (CP10)

A high level of workload precipitating a faster pace of work was thought to be associated with impaired cognitive processes. Therefore, most participants identified slowing down the pace of work by reducing the level of workload as a key approach to preventing dispensing errors.

'Probably the workload, when you've got a lot of items you don't have the time to slow down... so you can misread something. Your brain can play up with you, you know, you think you're reading the right thing but later you realise that you were reading the wrong thing or picking up the wrong product or something like that.' (CP02)

Participants also presented the idea of putting in place safe dispensing limits.

'The measure shouldn't be that I can do it faster than someone else. What the measure needs to be is what can the least experienced pharmacist do? What happens if I've gone off sick as I've said before, the main dispenser had gone on holiday, and a locum comes or any inexperienced pharmacist. Are they able to cope with that level of work and give the level of service and feel safe environment where they can occupy?' (CP04)

'I think there is something about the number of items dispensed per pharmacist when it becomes a ridiculous number of items however many support staff... unless you've got ACTs but even then you have to at least look at the prescription and do the clinical check before you give it to the ACT.' (CP01)

By managing the high levels of workload, individuals would be able to pay attention to the task at hand. This would prevent scenarios where attention is divided due to increasing levels of multitasking.

'Simplifying the work and allowing the person that's doing whatever it is they're doing to only do that, not expecting them to do six jobs.' (CP11)

Whilst the provision of clinical services was found to be enjoyable and professionally rewarding, participants were unsure of their benefits for the patients. A range of services was thought to be disruptive of workflow processes. Participants considered the provision of services on an appointment basis as a way of managing workflow, but argued that doing so would undermine accessibility - a distinguishing feature of pharmacy. Also it would be an approach that companies would be reluctant to adopt due to the financial losses that would be associated.

'To be honest, the services, I'm not quite sure how much they benefit the patient, but we have to do it just to get it done.' (CP08)

'Services, there's lots of them, company would not give them up and majority is the MUR and NMS and morning after pill, you could do them but those ideally should make an appointment, but you can't do that, I don't know how you can manage that, because that carries income wise you know... a big impact to the pharmacy, and the targets as well.'
(CP12)

Staffing

Strategies related to staffing included improving the training of support staff, having a second pharmacist, and increasing the number of support staff numbers. Improvements in the support staff training was by far the most frequently cited preventive strategy.

'The main change that I think would be is to have better trained staff in community pharmacy. That is the main change that I would suggest.'
(CP03)

Some participants identified that improvements in staff training would begin with breaking a prevalent culture of acceptance towards and normalisation of dispensing errors.

'To me the people who are obviously dispensing need to be accurate, and nobody is going to be 100% accurate, I understand that people are going to make mistakes, and that's why we have second checks but sometimes I feel like I'm working in environments where there is an acceptance that people make mistakes.' (CP07)

Similar concerns were echoed by participants identifying that training dispensary support staff to take responsibility towards their work was essential and necessary to form effective teamwork amongst the dispensary staff.

'I think it's about getting the right... to reduce the errors it's about getting the right team in place, it's about having staff in place who are well trained at doing the job that they do. Places where you've got really good teams working together, you tend to get less problems than places where people aren't pulling together. If everybody took responsibility in doing their job that they're being tasked, then it all works pretty well.' (CP10)

'Probably in the staff, it's really important that the staff is more aware of... because I have seen how they do it. They go phuff phuff, they don't really check it, they don't really know.' (CP02)

However, around a third of participants identified that improving the calibre of staff would begin with having tougher entry criteria and the development of more rigorous training programmes and assessment.

'The first thing is the calibre of the staff. To have good quality staff you need to first look at the raw material you've got. You need to have people who have got 5 O-levels, maths needs to be one of them. When you actually select people, I think what you need to do is you need to give

them a training programme where you take the time over training, you do it properly and it's not seen as a tick box exercise. You probably even need to set an exam at the end of the training and the exam at the end of the training... needs to be an external exam, or certainly a very rigorous exam to measure their understanding. If people are not of the right calibre, you need to take away any emotion that you like the person and if they're not of the right calibre they shouldn't be in the dispensary.' (CP04)

Similarly, along with having minimum qualification requirements, participant CP06 identified putting in place caps on prescription numbers, above which would make it mandatory to employ an ACT.

'As far as people working on the shop floor with the pharmacist, they need to be at least NVQ 3 trained, if not above. If you are having a pharmacy that is doing the clinical services such as the travel vaccines, flu vaccines and all the rest of it and your [prescription] numbers are above a certain cap, you need to have an ACT in place.' (CP06)

However, a quarter of participants also highlighted that remuneration structures of dispensary support staff would have to be conducive to the upskilling of pharmacists and dispensary support staff.

'It's the up-skilling, no doubt about it, it's the up-skilling, and the remuneration for that up-skilling.' (CP06)

'Maybe look at the pay rates as well, because the pay rates that are given can sometimes... well I suppose people with qualifications expect more pay and I think it is a demanding job and I think it is a very professional job at any level, even for the dispensers you know I think there's got to be something, the pay rates for the pharmacists and the support staff, you know to attract the right people, with the right qualifications, the right calibre for the job, it's got to be the right pay.' (CP09)

Along with improving the training of dispensary support staff, half of the participants cited that staffing levels would need to be improved. Participant CP07 identified that having adequate levels of support staff would be necessary for smoother workflow. Low staff numbers meant there was greater pressure on the pharmacist to complete the workload, which would head towards an unpleasant level of work pressure. Similarly, over-staffing would mean the pressure to complete the tasks per individual would decrease reducing the engagement of individuals to the task.

'But you know you've got to have the right number of support staff, you need the right amount of pressure to keep you going.' (CP07)

Participants also identified putting in place systems or policies outlining the minimum numbers of staff required for the safe and effective running of the pharmacy, and also to have in place additional cover at times when there are staff shortages.

'You know you need to have a traffic light system for each shop. You need to say well with this volume of items, how many can a pharmacist do. This is the staff levels you need to do, and you need to have in place additional staff so you can call on people if there's shortages.' (CP04)

Over half of the participants (n=7/12) cited having two pharmacists per pharmacy as the most effective approach to deal with current workload demands. Participants identified the excess of pharmacists in the country to be a problem too, and by employing two pharmacists per store, that would be a solution to both problems.

'If you've got a pharmacist that can concentrate on their customers and the essential services and somebody whose dealing solely on your other services, that are clinically orientated, you're not going to have a problem. You've got the country having an excess of pharmacists, why aren't the NHS putting a second pharmacist into each pharmacy in a consultation room doing the job they need to?' (CP06)

Similarly, participant CP05 highlighted the difficulties in carrying out both the dispensing of medicines and the provision of clinical services by one pharmacist. Whilst participants were open to the provision of clinical services, some participants stated that giving up the supply function of their role was something that they were not keen to do. Having two pharmacists per pharmacy was considered to be the only approach that would preserve both the supply and clinical functions of the pharmacist's role.

'At the moment, until they resolve or sort something out, but the obvious solution would have been two pharmacists per shop, but that costs too much actually... Well ultimately, they need... now if they're going to have all these services, they need pharmacists to do it. The companies aren't going to put two pharmacists, but if you're going to be doing more and more services, I can't see any other way around it coz you can't do both, unless it'd be a shame but unless pharmacists relinquish dispensing.'
(CP05)

However, participants perceived reluctance on the part of employers and companies to implement such change due to the high costs that would be associated with it. However, participant CP08 makes reference to some pharmacies where such measures have been put in place.

'I don't know what the solution is, but the way it is moving towards pushing the services, more and more services to be done, and community pharmacy because of the ease of access, I think... maybe some companies now they're recognising it is time to employ two pharmacist at a time... I think it's reached the stage where one pharmacist cannot manage it anymore, so they're bringing a second pharmacist which is really good, which is quite good and if we manage to do that in all branches that would be great but I don't see that happening.' (CP08)

Managing patient expectations

Managing patient expectations was the third most frequently cited preventive strategy in this study. Participants suggested that patient expectations can be aligned by educating the public about the role of the pharmacist.

'We're supposed to attend to whatever query and you might be dealing with one customer, there might be two colleagues on the shop floor and they don't know the answers, and yet you need to do all three consultations at the same time. It's not easy, it wears on your energy levels, on your mind, and it's just distracting. So I think a lot of it is to do with customer expectation and the fact that sometimes we need to do more with letting the public know what the job is, what is a pharmacist's job?' (CP06)

Participants also suggested that informing patients at the outset about the waiting times is important in managing expectations.

'It means saying to people, no that won't be in till tomorrow, people have such... and I hate doing... I hated doing that... and people accept that when they know that you only ordered that Monday, it won't be ready till Thursday, that's fine, people are not quite so... it takes maybe a couple of times and folk will complain, but I think slowing down people's expectations.' (CP11)

Participant CP01 took a firm stance not to give in to unreasonable demands of patients so as to maintain the overall safety. She identified how giving in to one patient's expectations can create an imbalance in the workflow processes and threaten the safety of a system.

'I take the attitude that if the customer says that no I'm not going to come back in twenty minutes because the pharmacist is on a break, well tough! You know, yes if it was life or death, of course I would come out and

interrupt my break, but then I would make the time up, but I wouldn't want that to be a regular thing... that would be an exception... because I don't want to kill somebody else. You know... but if that person is just in a hurry because I don't know their child is a bit whingy and then you end up poisoning somebody else... you know... it's not worth it.' (CP01)

Manage distractions

As discussed earlier, participants perceived that the frequency of distractions were increasing in community pharmacy – partly due to escalating workload and the increasing range of functions expected of the community pharmacist, and also due to higher patient expectations. As such, half of the participants cited managing distractions as a key preventive strategy.

'I suppose, like I said it's just being able to balance these other conflicting or distracting things which we have to do.' (CP07)

Some participants highlighted the need for pharmacists to take the initiative to identify any distractions and make any changes necessary within his/her own sphere.

'All the factors that can make you lose your concentration you, have to reign on them and do something... change them. You have to identify them first and then change them. I think all the factors that make you feel distracted, at least the ones that you can change, you should... One, I got rid of the music.' (CP02)

Once again participants were keen to put forward the idea of appointment-based provision of care, but were quick to retract the statements after considering the impact of such measure on the business or the accessibility of pharmacists.

'I don't know it impacts on the business... Distraction wise can somebody... But I think I don't know how to defend, the thing is it's hard to say... I would like to have it like the GPs... I'll answer their queries at the end of the day... but you can't do that in community because it would

impact on the business... so... it's basically try to minimise the distractions.' (CP12)

Sufficient and regular rest breaks

Ensuring sufficient and regular breaks was the fifth most frequently cited preventive strategy that participants identified.

'I think you need at least fifteen minutes uninterrupted in the morning and in the afternoon to constitute a break, I do think that it would help.' (CP03)

'People should have adequate breaks, people should have 15 minutes in the morning, an hour for lunch, and fifteen minutes in the afternoon.' (CP04)

However participant CP01 elaborated further and suggested that taking sufficient and regular rest breaks should be a mandatory requirement to maintain safety within pharmacies. Whilst earlier discussions have highlighted a corporate culture where taking rest breaks can be frowned upon, participant CP01 illustrates an alternative dimension. Some participants may make a conscious choice not to take a rest break in attempt to maximise income.

'I think if I had to choose anything I would say it was about the number of hours worked in a shift and the breaks... and I think it's got to be a minimum of half an hour break, twenty minutes just about OK, but I think half an hour is better, so I think it should actually be legal and I don't think it should be left to professional discretion... because then there is a comeback to say that we have chosen not to take a break and especially maybe some of the younger ones, maybe they've got pressures of mortgages to pay off or older ones might be in debt... I shouldn't generalise I do apologise, it's an ism isn't it... You know they may have some pressures that they're thinking... if I take an unpaid half an hour break then I'm losing half an hour's pay so I shall work through it and until you've made a serious dispensing error, maybe they're not going to take

it serious, that they are human and they can make a mistake. I think maybe because that happened and I'm older I have a lot of experience and maybe I am of a personality type with a bit more anxiety so yes I take it a bit more seriously. So I think that's a biggest thing.' (CP01)

Summary of theme three

Present working conditions in which the occurrence of dispensing errors was perceived to be increasing was associated with raised levels of stress, anxiety and fear amongst community pharmacists. The occurrence of a dispensing error can have strong, and in some cases, lasting physical, emotional and psychological responses in pharmacists, and reduce pharmacists' confidence in their abilities. Pharmacists perceive a high burden of responsibility for their work, which, for a minority can have a substantial impact on pharmacist's health and wellbeing, their personal relationships, and their careers. However, the occurrence of dispensing errors was said to make pharmacists more diligent in their work. Managing high workloads by putting in place safe dispensing limits, and improvements in staff training were identified as essential error prevention strategies. Putting in place a second pharmacist in every pharmacy was considered to be a viable and effective solution to many of the problems and challenges faced by pharmacists.

5.6 Discussion

The aim of this study was to explore pharmacists' perceptions of factors which contribute to dispensing errors, experiences following a dispensing error, and the impact that these experiences have had on the pharmacist's practice. Three key themes emerged from data analysis: working conditions in community pharmacy; the role of the community pharmacist; and the experiences and attitudes of community pharmacists towards dispensing errors. The first two themes are very much interlinked and interdependent, whilst the third appears to be a product of the first two.

The present study is believed to be the first to describe the deteriorating working conditions in community pharmacy as perceived by community pharmacists

specifically in relation to the occurrence of dispensing errors. A key finding in this study is the threat that present working conditions in community pharmacy were perceived to be having on the safety of patients and the occurrence of dispensing errors. In keeping with previous research, pharmacists perceived an intensification in their workload in both the dispensing of medicines and the provision of clinical services (Bond et al., 2008, Eden et al., 2009, Gidman, 2011, Gidman et al., 2007, McCann et al., 2009a). Furthermore, the issue of inadequate staffing levels and skill mix was also a frequently raised concern. Escalating workload was thought to be arising from a range of different factors including:

- Increasing volumes of prescriptions items being dispensed
- Provision of a greater number and range of clinical services
- The target-driven approach to the provision of pharmaceutical and clinical care adopted by some pharmacy employers
- Increasing patient expectations due to increased availability of health information online and advertisement of pharmacy services
- Cuts in health funding resulting in the public resorting to access community pharmacists for health services and advice as opposed to GPs.

These factors were perceived to contribute to increasing levels of multi-tasking and distractions leading to stress and work pressures - ultimately precipitating work environments in which the rate of dispensing errors is thought to have increased. High workloads or faster pace of work, inadequately trained support staff, and work pressures were the top three risk factors that the pharmacists in this sample believed to be increasing the likelihood of a dispensing error occurring.

A lack of understanding of the role of the community pharmacist and a blurred professional identity emerged as prominent themes in relation to public perceptions of community pharmacy. Furthermore, a minority of pharmacists attributed the poorer quality of dispensary support staff training, and/or a lack of experience of the dispensary support staff due to high staff turnover to obscuring, over time, the specific role of the community pharmacist in the minds of some dispensary support staff. Whilst

the majority of pharmacists were keen to embrace the extended clinical role, the provision of a larger range of clinical services, for some, was thought to further erode an increasingly unclear role, as one pharmacist explained, '*I think by time we are starting to lose the understanding of the role of the pharmacist and expecting them to cover everything and be responsible for everything*'. Conversely, pharmacists were reluctant to relinquish the dispensing function as it remains the defining feature of the pharmacist's role. Additionally, pharmacists perceived that the critical position of community pharmacy along the patient care pathway is not always understood and appreciated by patients. Demanding non-pharmacist managers were also thought to be impinging on the professional prerogative of pharmacists, undermining the authority held by pharmacists over their professional duties. A combination of these factors were considered to be working to create a tension at the pharmacist-support staff interface as well as the pharmacist-patient interface ultimately resulting in increasing levels of pressure on the community pharmacist. In this respect, pharmacists believed that a range of functions performed by pharmacists, combined with ambiguities in public, and in some cases support staff, perception as to the role of the community pharmacist were combining to increase the risk of dispensing errors occurring.

Entwined within the discussions of deteriorating working conditions and the role of the community pharmacist was the issue of corporatisation of community pharmacy. The community pharmacy contractual changes of 2005 were an attempt to re-professionalise pharmacy after the profession underwent a period of de-skilling as their monopoly over drug manufacture and supply became eroded due to the expansion of the pharmaceutical industry (Harding and Taylor, 2015). The new pharmacy contract was an attempt to move community pharmacy away from its traditional technical and supply function and towards a new health-orientated and care focused paradigm. However endeavours for role expansion have coincided with the growing corporatisation of the community pharmacy sector. In 2016, large multiples (100 or more pharmacies) made up almost half of the community pharmacy market in Great Britain (Sukkar, 2016). The corporatisation of community pharmacy has led to an increase in the number of employee pharmacists (Bush et al., 2009). This means

that pharmacists are subjected to work in organisations that adopt working practices and procedures designed to maximise economy, efficiency and competition (Bush et al., 2009). In doing so, the dispensing of medicines and the provision of clinical services are delivered in a rationalised and standardised fashion, in accordance with company policies (Taylor and Harding, 2003). These factors have led some to suggest that the growing corporatisation of community pharmacy is undermining re-professionalisation (Bush et al., 2009).

Much of the perpetual tension expressed by pharmacists in the present study, in terms of deteriorating working conditions and role conflict, appeared to arise from the dual role of a community pharmacist as a healthcare provider and an employee of a profitable business. The majority of pharmacists, not contingent on gender, felt that their professional autonomy had been challenged. Participants in the present study articulated that a target-driven approach to the provision of pharmaceutical and clinical care by large multiples left pharmacists having to sacrifice professional ethics over business-driven demands. For example participants expressed their concerns regarding expectations by the company to provide services or sell products despite the pharmacist deeming it unnecessary, or being unable to voice their legitimate concerns as a pharmacist so as to avoid hostility from the company management. Whilst pharmacists were keen to put professionalism and patient safety ahead of corporate imperatives, performance-based employment contracts only hamper pharmacists from voicing their concerns. Some pharmacists also expressed a culture in larger corporate chains, where, in attempt to maximise economy and efficiency, pharmacists are required to work in poor working conditions with minimal resources. As such, and as a result of the commercial or profit-seeking interests, the overarching risk factor in relation to dispensing errors in community pharmacy was identified to be the corporatisation of community pharmacy.

Given the paucity of research, this study extends our understanding of the attitudes and experiences of community pharmacists towards dispensing errors and the impact that these may be having on pharmacists' personal life and working practice. For a majority of pharmacists, there is a genuine fear that in current working conditions, their

exposure to the risk of making a dispensing error is very real and, indeed, higher now than it has been in the past. This has been associated with an increased level of anxiety and stress, and in a minority of cases, it has had a substantial impact on the health and wellbeing pharmacists. These findings raise a genuine concern about the direction of travel for community pharmacy. With escalating workloads, stress and work pressures, diminishing job satisfaction, and a growing corporatisation of the profession compromising pharmacists' ability to exercise impartial professional judgement, one may assume that the risk of patient harm may increase in the future. Furthermore, the occurrence of a dispensing error was found to have both short-term and long-term impacts on the physical, emotional and psychological level. Research looking into working conditions and role expansion have highlighted the impact the present working condition can have on the health and well-being of some pharmacists (Gidman, 2011, Gidman et al., 2007, Hassell et al., 2011). The findings of the present study add a new dimension to the current debate – the impact that the occurrence of a dispensing error in current working conditions can have on the pharmacist's practice and health and well-being.

Whilst the occurrence of a dispensing error had a temporary negative impact on the confidence of pharmacists, most felt that it did make them more diligent in their working practice. However some pharmacists expressed the difficulties they faced in trying to get back to work after finding out about a dispensing error. Due to a lack of research in this field, employers may not appreciate the considerable impact that the occurrence of a dispensing error may have on a pharmacist. For example, a minority of pharmacists that continued to work in a state of shock after being made aware of the dispensing error reported the occurrence of a near-miss or a new dispensing error. It is of note that pharmacists feel that present working conditions, where high levels of workload demand fast pace of work, are not conducive to learning from dispensing errors. Whilst company policies and procedures about dealing with dispensing errors take into consideration the significance of the error on the patient, it appears that the impact on community pharmacists often goes disregarded.

Error prevention strategies were focussed around improving the deteriorating working conditions in community pharmacy, for example, management of escalating levels of workload, improvements in staff numbers and training, management of distractions. As mentioned previously, key areas for improvements were in part those that have arisen as a result of the corporatisation of community pharmacy. A key error prevention strategy identified by pharmacists was the concept of two pharmacists per pharmacy, as a way of preserving both the clinical and dispensing function.

5.6.1 Strengths and limitations of the study

This is the first qualitative study to research the experiences and attitudes of community pharmacists towards the occurrence of dispensing errors in community pharmacy. Whilst the qualitative nature of the study means the findings are not generalisable to the rest of the population of community pharmacists, the results have helped to identify issues that pharmacists consider to be important to this topic and have given a sense of direction as to the areas that warrant further investigation. Due to an initial low response rate, and in an attempt to increase the sample size, the inclusion criteria were changed. This resulted in two pharmacists being those that were subjected to a clinical negligence claim whilst the remaining spoke in general about their experiences of dispensing errors. This was considered a strength as it produced good quality data and wide ranging viewpoints of pharmacists.

However, due to the sensitive nature of the research topic, recruiting participants was found to be difficult. By chance, and potentially due to a greater resonance of the research topic, the majority of participants that opted to take part in the study were employees of large multiples, with comparatively fewer participants from supermarket or independent pharmacies. This could have confounded the results as the majority of the viewpoints in this study are of one group of pharmacists.

5.7 Conclusion

This qualitative research study has shed light on the experiences and attitudes of community pharmacists towards dispensing errors. The issue of dispensing errors is

one of great importance to community pharmacists. Pharmacists believe that the growing corporate culture in community pharmacy is precipitating poor working conditions in which the likelihood of a dispensing error is perceived to have increased. Working in error-prone environments can induce strong physical, emotional and psychological responses in pharmacists, and in some cases have a detrimental and lasting impact on an individual's career choices and personal interactions. The present study has identified the need to quantitatively investigate further the impact of present working conditions on pharmacist's perceptions of dispensing error occurrence.

Chapter 6

A Cross-sectional Survey Examining the Experiences and Attitudes of Community Pharmacists towards Dispensing Errors and Their Role in Ensuring Patient Safety during the Dispensing Process

6.1 Introduction

The previous chapter described a qualitative study which explored the attitudes and experiences of community pharmacists towards dispensing errors and the impact that these experiences have on the pharmacists practice and health and wellbeing. The findings highlighted the issues of deteriorating working conditions and the corporatisation of community pharmacy. These findings prompt the need to investigate these issues further by taking a quantitative approach to assess the relationships between these factors and the occurrence of dispensing errors. The aim of this study was therefore to develop a data collection instrument that could be used to gain an assessment of what pharmacists consider to be contributory factors and predictors of dispensing errors, pharmacists' working conditions as well as their opinions of error prevention strategies.

6.2 Methods

6.2.1 Study design

This study used a cross-sectional survey design to identify predictors of dispensing errors in community pharmacy. An online survey was administered via e-mail to around 12000 registered community pharmacist members of the PDA.

6.2.1.1 Rationale for survey methodology

Survey methods use a systematic method to collect data directly from respondents using standardised questionnaires for the purpose of quantitatively analysing a target population (Callegaro et al., 2015, Shi, 2007). Surveys can be considered a useful approach to explore factors associated with phenomenon of interest and test hypotheses (Shi, 2007). As a research method, surveys, in particular cross-sectional surveys, are considered the most commonly used method of data collection (Shi, 2007). Cross-sectional surveys capture response data from a sample of a target population at one point in time (Shi, 2007). Previous research has adopted cross-sectional survey methodology to explore the causes of dispensing errors in community pharmacy (Bond and Raehl, 2001, Peterson et al., 1999).

Online surveys fall within the broader category of survey methods. Whilst retaining the same principles of general survey methodology, online surveys can offer several additional advantages. First, online surveys can be time-efficient as fast electronic transmission of surveys, and their responses can yield quick turnaround times (Shi, 2007, Wright, 2005). Due to time limitations for the present study, this proved to be a key advantage. Second, online surveys offer consistency in delivering questions and collecting responses (Shi, 2007). Third, barriers associated with reaching wider geographic locations are lowered thereby allowing access to groups and individuals who would be difficult, if not impossible, to reach through other channels (Shi, 2007, Wright, 2005). For the present study, conducting an online survey allowed all UK community pharmacists registered with the PDA to take part in the survey if they wished to do so. Fourth, online surveys can be relatively cheap as costs associated with paper and postage are eliminated (Shi, 2007). Fifth, online surveys give respondents the flexibility to complete the survey at their convenience (Shi, 2007). An additional advantage that online surveys can offer is that data entry is not a separate process, therefore errors associated with data entry are reduced (Shi, 2007).

However, disadvantages associated with online surveys were also considered. Respondents must be able to read and navigate web pages as well as be proficient in

using a keyboard and a mouse (Shi, 2007). However, for the present study, this was not anticipated to be a concern as all the respondents were community pharmacists based in the UK, therefore, all highly likely to be familiar with the use of the internet and keyboard and mouse. Online surveys can also be considered to be associated with a lack of opportunities to clarify ambiguous questions. Furthermore, an opt-in approach taken by online surveys may be associated with a systematic self-selection bias, where some individuals choose to take part whilst others do not (Shi, 2007).

6.2.2 Ethical approval

This study was approved by the Life and Health Sciences Research Ethics Committee at Aston University (application #907, approved 31/07/2017).

Some challenges were faced whilst obtaining ethical approval for the study. The main issues raised were the issues of gaining consent along with issues related to access of the PDA database. The online survey initially had an opt-in consent form embedded at the start of the survey, however the committee considered that to be unsatisfactory and required a full standard consent form to be included. This was then included at the start of the survey. Regarding access to the PDA members, clarification was made that the researcher would not make direct contact with PDA members. Rather, the researcher would liaise with the PDA, who would then send out e-mails on behalf of the researcher inviting pharmacists to take part in the survey. Gaining approval for the amendments that were sent through delayed the study by about two months.

6.2.3 Development of the survey instrument

The items in the survey instrument were informed by the findings of the retrospective database analysis (chapter 4), the qualitative study (chapter 5) and the literature review (chapter 1). A previously validated questionnaire used by Peterson et al. (1999) to assess the attitudes of Australian community pharmacists towards the issue of dispensing errors was adapted to serve as a basic structure to the survey instrument. Some items were omitted from the questionnaire whilst several others were added to meet the needs of the present research study. The survey instrument constituted six

key sections: occupational details, dispensing of medicines, contributory factors, prevention of dispensing errors, working conditions, and an 'about you' section gathering respondents' demographic data. These will now be discussed.

6.2.3.1 Occupational details

This section contained seven items in total including:

- The pharmacist's background in community pharmacy
- The year of registration
- Part-time/fulltime employment
- The type of job they held as a community pharmacist
- The types of pharmacies worked in regularly - classified according to the definitions given by Bush et al. (2009)
- The average number of hours worked per day
- A breakdown of the amount of time spent in various activities during the average working day.

In accordance with the approach taken by (Bond and Raehl, 2001), item seven was included to gain an insight into the time that pharmacists commit to various aspects of their role as well as to gauge an understanding of how differences in work activities may impact pharmacists' perceptions of error occurrence.

6.2.3.2 The dispensing process

This section contained eight items relating to the dispensing of medicines and the pharmacist's assessment of risk associated with errors. The first of these was a multiple choice item about the number of prescriptions dispensed in an average working day. The choice of responses increased in increments of 100. Taking into consideration that the number of prescription dispensed on the day of error ranged from 9-1539 with a mean of 314(\pm 198) in the retrospective database analysis study (chapter 4), increments of 100 were considered to provide a more accurate assessment of the level of dispensing activity undertaken by pharmacists in

comparison to increments of say, 200 or 300. Three items in this section related to the pharmacist's assessment of the risk of dispensing errors and whether they had observed a change in the incidence of dispensing errors and near-misses. A further four items related to the pharmacist's assessment of the incidence of dispensing errors and near-misses.

6.2.3.3 Contributory factors

This section contained a single grid type question with seventeen items. Participants were asked to indicate the extent to which they believed the listed contributory factors were associated with dispensing error occurrence on a scale of 0 to 10, with zero indicating 'no association' and 10 indicating 'very high association'. Contributory factors included were based on the results of the retrospective database analysis study (chapter 4), qualitative interviews (chapter 5) as well as previous literature (Ashcroft et al., 2005, Gidman, 2011, Gidman et al., 2007, Hassell et al., 2011, James et al., 2009, Peterson et al., 1999).

6.2.3.4 Preventing dispensing errors

This section contained three items. The first was a grid type question with fourteen items. Participants were asked to indicate the extent to which they agreed with the statements concerning the prevention of dispensing errors on a scale of 0 to 10 with zero indicating 'not important' and 10 indicating 'very important'. The statements were primarily informed from the results of the qualitative study (chapter 5). The remaining two items in this section, adopted from Peterson et al. (1999), were concerning safe dispensing limits. Participants were asked whether they believed there should be a regulatory guideline for the maximum safe dispensing load in the UK. Those who felt a safe dispensing limit was necessary were further asked to give a suggestion as to the number of prescription items they believed could be safely dispensed per day (9am-6pm) by/in the presence of one pharmacist with no dispensary support staff. The wording of this question required particular attention. Whilst the researcher appreciates that a considerable number of pharmacists work as part of a dispensary team, the wording 'by/in the presence of one pharmacist with no dispensary support

staff' was considered necessary to gain a uniformity in the responses as a well as avoiding bias that may be associated with larger or more qualified dispensary support staff.

6.2.3.5 Working conditions

This section contained a single grid type question with twenty one items. Participants were asked to indicate the extent to which they agreed to the statements on a 5-point Likert scale ranging from strongly disagree/disagree/neutral/agree and strongly agree. This section was primarily informed by the results of the qualitative study (chapter 5), which, in keeping with previous research highlights the issue to deteriorating working conditions in community pharmacy (Eden et al., 2009, Gidman, 2011, Gidman et al., 2007, Hassell et al., 2011, Johnson et al., 2014). The items covered issues relating to workload, working hours, staffing levels, staff training, work pressures and stress, rest breaks, availability of seating, professional autonomy and job satisfaction. One of the items measured stress levels outside of work to enable a comparison of issues that may contributing to raised stress levels due to work activity. Two items were related to the functions of the pharmacist's role that they enjoyed most: the dispensing function and the clinical function. These were included to gain an indication of how role expansion may be related to pharmacist's perceptions of error occurrence.

6.2.3.6 Demographic information

This section contained three items. Participants were asked to indicate their age group (under 30, 30-39, 40-49, 50-59, 60 and over, prefer not to say), their sex (male, female, prefer not to say) and their ethnic background (again participants were given a 'prefer not to say' option).

6.2.4 Procedure

The online survey was designed using Snap (version 11). The survey was designed to be compatible on PC/laptops, tablets and smartphones. Around 12000 community pharmacist members of the PDA were invited via email (appendix 6) to take part in

the survey. The e-mail had attached to it a participant information sheet (appendix 7), and contained within it a link to the survey. Contact details of the researcher were provided in the email in case participants required further information. The participant information sheet outlined the background to the study and gave details about the survey. Participants were informed that participation in the study is entirely voluntary and that they could withdraw any time they liked without having to provide a reason for doing so. Additionally participants were also informed that their responses will be kept confidential.

Originally, it was planned that after the initial email inviting community pharmacists to take part in the online survey, a reminder email would be sent out weekly. Since it was not possible to track pharmacists who had completed the survey and those that had not, the email was sent out to all community pharmacists registered with the PDA. However, due to a high level of e-mail activity by the PDA to members coinciding with the present research study, on several occasions, e-mails inviting participants to take part in the research study had to be postponed. Due to these factors and time limitations, in total three e-mails were sent out during August to mid-October 2017.

6.2.5 Analysis

The responses received were screened for duplicate entries, errors in entering responses and the frequency of missing data. The survey responses contained very little missing data. In total 0.8% data fields were missing, which could be considered inconsequential to the study findings (Schafer, 1999). Descriptive statistics and frequencies were obtained and categorical data analysis was performed using IBM SPSS v23 for Windows (SPSS Inc., Chicago). Cross-tabular analyses of association between variables was undertaken. The statistical test used to assign the level of significance of association between the variables was the Chi square test. The a priori level of significance was set at a p value below 0.05.

Kruskal Wallis H test was performed to analyse differences in the type of pharmacy ownership and views on contributory factors to dispensing errors and error prevention

strategies. Kruskal Wallis H test was also performed to analyse differences between pharmacy ownership and dispensing error/near-miss risk/likelihood and working conditions.

6.3 Aims and Hypotheses

This study sought to identify whether the type of pharmacy ownership influenced pharmacists' opinions of the contributory factors of dispensing errors, their opinions on the most effective error prevention strategies, their perceptions of the likelihood of dispensing errors/near-misses and their opinions of working conditions in community pharmacy. Therefore the following null hypothesis was tested in this study.

H₁₀: The Kruskal Wallis H test will reveal no statistical association between the type of pharmacy ownership and:

1. Pharmacists' opinions of contributory factors of dispensing errors.
2. Pharmacists' opinions of effective error prevention strategies
3. Pharmacists' perceptions of the likelihood of dispensing errors/near-misses
4. Pharmacists' opinions of working conditions in community pharmacy.

6.4 Pilot study

The online survey was piloted on a convenience sample of fourteen colleagues. The main aim of the pilot study was to test the usability of the online survey as well as the readability and comprehensibility of the survey. The pilot study revealed minor faults in the survey design.

The main concerns raised were regarding question seven. First, some respondents expressed a difficulty in completing this question primarily due to in-putting time in the required fields in a combination of hours and/or minutes. Despite the wording '(in hours)' being present in the question, a few respondents were unable to adhere to this requirement of the question. As a way of overcoming this, the wording '(in hours)' was

highlighted in red to make it stand out. The second issue raised regarding this question was pertaining to the options of work activities provided which included: dispensing of medicines, clinical services, administrative/management work, professional development and breaks. However, one respondent highlighted the need for an 'other' box for any activities which do not fit any of these options.

6.5 Results

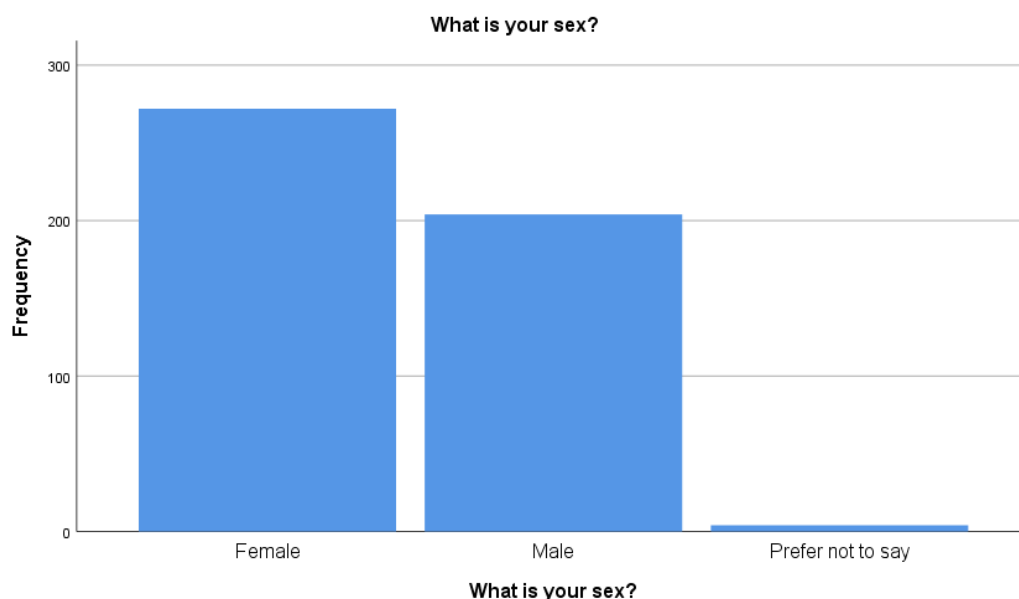
6.5.1 Response rate

In total, of the 12000 PDA community pharmacist members invited to take part in the online survey, 485 responses were received. However five responses were from pharmacists not working in community pharmacy and were therefore excluded from analysis. This left a final total response of 480 completed surveys, yielding a very low response rate of 4%.

6.5.2 Sample characteristics

The sample consisted of 42.5% (n=204/480) males and 56.7% (n=272/480) female respondents. A minority of 0.8% (n=4/480) preferred not to indicate their sex. The sample consisted a variety of age groups: 13.3% (n=64/480) under 30 years of age, 25.4% (n=122/480) aged between 30-39 years, 17.9% (n=86/480) aged between 40-49 years, 26.0% (n=125/480) aged between 50-59 years and 16.9% (n=81/480) aged 60 years and over. However, a minority of 0.4% (n=2/480) respondents preferred not to indicate their age group. In terms of the ethnic background of the participants, the White British respondents (58.3%, n=280/480) formed the largest ethnic group in this sample, followed by other White background (10.4%, n=50/4800 and British Asian (8.5%, n=41/480).

Figure 17 Gender of pharmacists



6.5.3 Respondents' occupational details

Tables 24-27 provide a summary of respondents' occupational details. The majority of respondents worked entirely in community pharmacy (89.4%, n=429/480). The number of years that the respondents had qualified as a pharmacist ranged from 1 year to 66 years, with a mean 21.44 years (± 14.24 sd). Almost three fifths (58.1%, n=279/480) of the sample worked on a full-time basis in comparison to 41.9% (n=201/480) who worked part-time. Just over a third of the respondents reported that they worked as a locum pharmacist (35.8%, n=172/480), around a quarter reported working as a pharmacist (26.3%, n=126/480), and just over a fifth reported working as a manager (21.3%, n=102/480). Almost half (46.9%, n=225) of the respondents reported working in a multiple pharmacy (200 outlets or more). This was followed by almost a fifth (19.6%, n=92/480) who reported working in an independent pharmacy (5 outlets or fewer) and supermarket pharmacy (16.7%, n=80/480).

Table 24 Survey respondents' background in community pharmacy

Background in community pharmacy	Percentage (number)
I work entirely in community pharmacy	89.4 (429)
I work partly in community pharmacy and partly in an(other) area(s) of the pharmacy profession	6.5 (31)
I work partly in community pharmacy and partly outside the pharmacy profession	3.1 (15)
I used to work in community pharmacy	0.6 (3)
I'm a retired community pharmacist	0.4 (2)
Total	100 (480)

Table 25 Survey respondents' full-time/part-time working basis

Full-time/part-time working	Percentage (number)
Full-time	58.1 (279)
Part-time	41.9 (201)
Total	100 (480)

Table 26 Survey respondents' occupational details

Job held within community pharmacy	Percentage (number)
Locum	35.8 (172)
Pharmacist	26.3 (126)
Manager	21.3 (102)
Relief pharmacist	10.6 (51)
Second pharmacist	5.0 (24)
Other	0.6 (3)
Proprietor/owner	0.2 (1)
Non-store based pharmacist	0.2 (1)
Total	100 (480)

Table 27 Survey respondents' type of pharmacy ownership of their pharmacy premises

Type of pharmacy ownership	Percentage (number)
Multiple (200 outlets or more)	46.9 (225)
Independent (5 outlets or fewer)	19.2 (92)
Supermarket	16.7 (80)
Large chain (more than 20 outlets but fewer than 200)	9.6 (46)
Small chain (20 outlets or fewer but more than 5)	7.7 (37)
Total	100 (480)

6.5.4 The dispensing of medicines and incidence of dispensing errors and near-misses

Table 28-32 show a summary of the descriptive statistics pertaining to respondents' dispensing activities and their perceptions of the incidence of dispensing errors. The average number of hours worked per day ranged from 4 to 16.5 hours with a mean of 8.93 (± 1.30). The results suggest that pharmacists in this study sample spend a majority of their time dispensing medicines.

On average, pharmacists spend two thirds (66.8%) of their working hours in the dispensing of medicines (5.97 hours). This was followed by 1.36 hours spent in providing clinical services, which accounted for 15.2% of the pharmacists' average working hours. The results showed that pharmacists spend around 5% of their working hours for rest breaks (0.47 hours). The least time was spent on professional development activities (0.09 hours), which made up around 1% of the pharmacists' average working hours. The average number of prescriptions dispensed per day was 333.4 (± 172.5).

The majority of pharmacists in this sample believed that the risk of dispensing errors in community pharmacy was increasing (80.6%, $n=387/480$), whilst 12.0% ($n=58/480$) believed that the risk was neither increasing nor decreasing. Similarly, when asked whether actual dispensing errors were becoming more or less common, 56.0% ($n=269/480$) pharmacists reported that they believed actual dispensing errors were becoming more common, whilst 26.9% ($n=129/480$) believed that actual dispensing errors were neither becoming more common nor less common. However, the majority of pharmacists in this sample believed that near-misses were becoming more common (79.0% $n=379/480$) whilst 16.0% ($n=77/480$) believed that near-misses were neither becoming more nor less common. Pharmacists were asked to indicate, according to their experience in community pharmacy, the likelihood of dispensing error and near-miss occurrence. Regarding dispensing errors, the majority of responses ranged from unlikely (1 error per month) (42.9%, $n=206/480$) to somewhat likely (1 error per week) (31.7% $n=152/480$). However, for near-misses a relatively higher likelihood of near-

miss occurrence was reported, with a majority of responses ranging from likely (1 near-miss per day) (27.1%, n=130/480) to extremely likely (several near-misses per day) (62.5%, n=300/480). The majority of pharmacists (90.4%, n=434/480) in this sample were aware of any dispensing errors in the past six months. The number of dispensing errors that pharmacists were aware of over the past six months ranged from 0 to 30 with a mean of 4.68 (± 4.49).

Table 28 Descriptive statistics of respondents' working hours per day and the number of dispensing errors they were aware of in the past six months

	Hours worked per day n=480	Number of dispensing errors aware of in past 6 months n=480
Mean (\pm SD)	8.93 (± 1.30)	4.68 (± 4.49)
Median	9.00	3.00
Range	4-16.5	0-30
Q1-Q3	8.50-9.50	2.00-5.00

Table 29 Mean number of hours spent on various work activities

Breakdown of activities during working n=480	Mean (\pm SD)
Number of hours spent dispensing medicines	5.97 (± 2.02)
Number of hours spent providing clinical services	1.36 (± 1.30)
Number of hours spent in admin/management activities	0.75 (± 0.84)
Number of hours spent in rest breaks	0.47 (± 0.37)
Number of hours spent in other activities	0.27 (± 0.80)
Number of hours spent in professional development	0.09 (± 0.27)

Table 30 Average number of prescription items dispensed during an average working day

Prescription items dispensed during average working day	Percentage (number) n=480
0-100	4.8 (23)
101-200	17.7 (85)
201-300	25.4 (122)
301-400	21.9 (105)
401-500	14.4 (69)
501-600	9.6 (46)
601-700	2.7 (13)
701-800	1.9 (9)
801-900	0.6 (3)
901-1000	1.0 (5)
Total	100 (480)

Table 31 Respondents' opinions of the occurrence of dispensing errors and near-misses

	Dispensing error occurrence increasing or decreasing? Percentage (number) n=480	Near-miss occurrence increasing or decreasing? Percentage (number) n=480
More common	56.0 (269)	79.0 (379)
Less common	5.2 (25)	2.3 (11)
Not more common nor less common	26.9 (129)	16.0 (77)
Don't know	11.9 (57)	2.7 (13)
Total	100 (480)	100 (480)

Table 32 Respondents' opinions of dispensing error and near-miss likelihood

	Likelihood of dispensing error occurrence (number) n=480	Likelihood of near-miss occurrence (number) n=480
Extremely unlikely	7.7 (37)	1.9 (9)
Unlikely	42.9 (206)	1.3 (6)
Somewhat likely	31.7 (152)	7.1 (34)
Likely	12.3 (59)	27.1 (130)
Extremely likely	5.2 (25)	62.5 (300)
Don't know	0.2 (1)	0.2 (1)
Total	100 (480)	100 (480)

6.5.5 Contributory factors

The internal reliability of the seventeen contributory factors variables was assessed using Cronbach's α , which gave a value of 0.89 indicating high internal consistency. The mean rating for each contributory factor variable is provided in table 27. Pharmacists rated staff shortages as most highly associated contributory factor with dispensing errors, followed by stress and work pressures and multitasking.

6.5.5 Error prevention strategies

The internal reliability of the fourteen error prevention strategy variables was assessed using Cronbach's α , which gave a value of 0.87 indicating high internal consistency. Three error prevention strategies were almost equally rated. These were: encouraging employers to create a safer working environment for pharmacists and pharmacy staff, putting in place policies outlining the number of staff required to run each pharmacy safely and, improving dispensary support staff training or recruiting dispensary support staff of a higher calibre. These were closely followed by reducing work pressures and reducing workloads on pharmacists. The mean rating for each error prevention strategy is provided in table 37.

A thematic analysis was performed on the open-ended question where pharmacists could give other suggestions they felt were important error prevention strategies. In total 123 open-ended responses were received. The most commonly suggested error prevention strategy pharmacists highlighted was to eliminate target culture. Pharmacists highlighted how a target –driven culture in community pharmacy was resulting in 'bullying' behaviour towards employees, as one pharmacist reports,

'Targets from management/head office - some companies are utterly focused on achieving a number (regardless of patient outcome), leading to bullying tactics and stressed employees.'

The second and third most commonly raised error prevention strategy concerned staff training and staff numbers respectively. Despite the fact that staff training was

amongst the fourteen error prevention strategies listed in the grid-type question, pharmacists highlighted this as a being a key issue in community pharmacy. Pharmacists suggested that the roles of dispensary support staff needed to be more defined and effective changes could be mediated through effective regulation.

'Roles and responsibilities of dispensary staff made more clear'

'Appropriate levels of TRAINED staff. We need proper set guidance from the GPhC about the number of hours of trained dispenser time needed per number of items.'

'Making workload and staffing levels part of the GPhC assessment [so] they can force changes especially with the multiples.'

These were followed by the issue of non-pharmacist managers who pharmacists reported as exerting unnecessary pressure to reach targets at the expense of pharmacists' discretion.

'Remove the massive pressures from NON-PHARMACIST commercial "managers" and area managers to provide figures for clinical services.'

'STOPPING MIDDLE (NON-PHARMACIST) MANAGEMENT PRESSURE TO M.U.R. EVERY ELIGIBLE PATIENT - THEY ARE REMOVING THE PHARMACIST'S DISCRETION.'

Pharmacists also identified the corporatisation of community pharmacy as a factor that compromised safety during the dispensing process and highlighted that a control over corporate culture in community pharmacy was an imperative step in preventing dispensing errors. Some of the responses provided by pharmacists are presented below.

'We should never have allowed multiples to destroy the profession for the sake of profits. We are now slaves in our own profession, being forced to do and work under unacceptable conditions.'

'Stop multiples'

'Corporate ownership of pharmacies must end because they are motivated by profit instead of professionalism which creates an unsound working environment. Legislation must be passed to return ownership of pharmacies to pharmacists such as the case in many countries around the world, e.g. France, Italy, etc.'

Some pharmacists also expressed feelings of vulnerability in an increasing corporate culture in community pharmacy and felt that companies use current SOPs to their own advantage as one pharmacist wrote,

'Current SOPs are used by pharmacy owners to scapegoat pharmacists and to allow them to get away with short staffing pharmacies by stating that pharmacist should take a mental break when self-checking. This SOP simply allows them to leave the pharmacy understaffed.'

Two items in the error prevention strategy section of the survey asked whether there should be a regulatory guideline for the maximum safe dispensing load in the UK. A majority (85.2%, n=409/480) of pharmacists in this sample believed that there should be a regulatory guideline for the maximum safe dispensing load in the UK. When asked approximately how many prescription items pharmacists believed can be safely dispensed per day (9am-6pm) by/in the presence of one pharmacist with no dispensary support staff, the responses ranged from 0-800 prescription items, with a mean of 134 (± 114).

6.5.6 Working conditions

Table 33 shows a summary of the working conditions variables. The most frequently chosen options for each statement have been highlighted in red, the second most frequently chosen option for each statement has been highlighted in orange, followed by yellow for the third most frequently chosen option for each statement.

Table 33 Frequencies of the working conditions variable

Statement	Strongly disagree Percentage (number)	Disagree Percentage (number)	Neutral Percentage (number)	Agree Percentage (number)	Strongly agree Percentage (number)
I feel I work longer hours than I consider to be safe	8.5 (41)	26.9 (129)	30.4 (146)	20.8 (100)	13.3 (64)
I feel that the dispensary support staff work longer hours than I consider to be safe	10.0 (48)	34.6 (166)	34.0 (163)	16.0 (77)	5.0 (24)
There are a sufficient number of staff to manage the workload overall	33.1 (159)	33.5 (161)	12.9 (62)	16.9 (81)	3.5 (17)
The staff I work with are adequately trained for their roles in the dispensary	13.1 (63)	27.3 (131)	18.5 (89)	33.3 (160)	7.7 (37)
In the event of a dispensing error, the dispensary staff are willing to learn from the incident	5.8 (28)	14.4 (69)	15.8 (76)	45.4 (218)	17.9 (86)
I feel that, in current working conditions there is a greater chance of an error taking place	3.1 (15)	5.4 (26)	15.6 (75)	40.6 (195)	35.2 (169)
The workload that I have to manage at work is more than I consider to be safe	2.1 (10)	15.0 (72)	21.9 (105)	35.4 (170)	25.0 (120)
I am constantly stressed at work	6.5 (31)	16.7 (80)	24.4 (117)	30.0 (144)	21.9 (105)
Outside of work, I am constantly stressed	23.5 (113)	31.5 (151)	20.0 (96)	16.3 (78)	8.3 (40)
The volume of medicines to be dispensed is the main cause of work pressure and stress	4.2 (20)	20.6 (99)	24.2 (116)	33.8 (162)	17.3 (83)
Providing clinical services is the main cause of work pressure and stress	2.9 (14)	19.2 (92)	28.7 (138)	36.0 (173)	12.5 (60)
Expectation to reach company targets is the main cause of work pressure and stress	2.9 (14)	7.7 (37)	14.6 (70)	33.3 (160)	41.5 (199)

Unrealistic patient expectations are the main cause of work pressure and stress	1.9 (9)	15.6 (75)	24.4 (117)	39.2 (188)	18.3 (88)
Dispensing of medicines is what I like best about my job	10.6 (51)	25.0 (120)	35.4 (170)	19.8 (95)	8.3 (40)
Providing clinical services is what I like best about my job	3.3 (16)	8.5 (41)	24.4 (117)	44.2 (212)	19.4 (93)
I feel I have sufficient rest breaks (mental and physical) during my working day	21.9 (105)	30.8 (148)	21.7 (104)	20.4 (98)	4.8 (23)
Taking a rest break when I feel overworked tends to be frowned upon	7.1 (34)	19.4 (93)	25.4 (122)	26.5 (127)	21.0 (101)
There is adequate seating available to sit on if needed	39.4 (189)	22.7 (109)	11.5 (55)	18.1 (87)	8.1 (39)
I feel I can easily make decisions using my professional judgement	4.4 (21)	9.8 (47)	15.8 (76)	53.8 (258)	15.8 (76)
I have to compromise my professional autonomy in order to maintain good relationships with my senior manager/colleagues	9.2 (44)	26.7 (128)	25.4 (122)	24.0 (115)	13.8 (66)
Overall, I am satisfied with my job	14.8 (71)	21.5 (103)	28.7 (138)	29.8 (143)	4.8 (23)

6.5.7 Cross-tabular analysis

Cross-tabular analysis of gender (table 34) and age (table 35) variables was performed against occupational variables and the safe dispensing limit variable. A significant association was observed between gender and fulltime/part-time working ($X^2=19.80$, $df=1$, $p<0.000$), with more females working on a part-time basis compared to males.

Table 34 Cross tabulation of the gender variable

Gender vs	X ²	df	p-value
Pharmacy background	1.71	4	0.789
Job	8.94	6	0.177
Part-time/full-time	19.80	1	0.000
Pharmacy ownership	2.17	4	0.704
Av. Prescriptions/day	9.35	9	0.405
Aware error/6 months	2.34	2	0.310
Safe dispensing limit	0.167	1	0.683

A significant association was also observed between age and job ($X^2=70.15$, $df=28$, $p<0.000$) and age and full-time/part-time working ($X^2=55.40$, $df=4$, $p<0.000$). Younger pharmacists were more likely to be working on a full-time basis in comparison to older pharmacists. Furthermore, older pharmacists tended to work on a locum basis, whilst younger pharmacists tending to work as a pharmacist or manager.

Table 35 Cross tabulation of the age variable

Age vs	X ²	df	p-value
Pharmacy background	9.28	16	0.902
Job	70.15	28	0.000
Part-time/full-time	55.40	4	0.000
Pharmacy ownership	2.17	4	0.704
Av. Prescriptions/day	9.35	9	0.405
Aware error/6 months	2.34	2	0.310
Safe dispensing limit	0.167	1	0.683

6.5.8 Comparison of pharmacy ownership and contributory factors

A Kruskal Wallis H test was performed to identify any associations between the type of pharmacy ownership and the contributory factors. A significant association was observed between seven of the seventeen contributory factors of dispensing errors and the type of pharmacy ownership, therefore rejecting the null hypotheses for these variables. A significant difference was observed between staff shortages ($X^2= 13.01$, $p<0.011$) and the type of pharmacy ownership. The mean ranks indicated that staff shortages was more highly rated by pharmacists working in multiple pharmacies as opposed to pharmacists working in independents. Similarly, a statistically significant association was also observed between multitasking and type of pharmacy ownership,

$X^2=15.844$, $p<0.003$, with a largest mean rank for large chains, whilst small chains had the smallest mean rank score.

A statistically significant association was also observed for stress and work pressures and the type of pharmacy ownership, $X^2=11.573$, $p<0.021$. An analysis of mean rank scores for each pharmacy showed that stress and work pressure were more highly rated by pharmacists working in multiple pharmacies as opposed to pharmacists working in independents. Interruptions and type of pharmacy ownership were also observed to be statistically associated to each other, $X^2=9.604$, $p<0.048$. Independents and small chain pharmacies had the lowest mean rank scores for interruptions, whilst the highest mean rank score for interruptions was observed for multiples. Furthermore, a statistically significant association was also observed between clinical services workload and type of pharmacy ownership, $X^2=11.127$, $p<0.025$). The mean ranks indicated that pharmacists working in multiple pharmacies rated clinical services workload more highly than pharmacists working in independents.

A statistically significant association was also observed between 'pressure due to waiting patients' and pharmacy ownership, $X^2=23.276$, $p<0.000$, with a greatest difference being observed between mean ranks of multiple pharmacies (highest mean rank score) and small chain pharmacies (smallest mean rank score). Pharmacist working on his/her own and the type of pharmacy ownership were observed to be statistically associated to each other, $X^2=9.837$, $p<0.043$. The mean ranks indicated that pharmacists working in supermarket pharmacies rated 'pharmacist working on his/her own' more highly than pharmacists working in independent pharmacies.

Table 36 Differences in contributory factors between different pharmacy ownerships

Contributory factor	N	Mean	SD	X ²	df	p-value
Staff shortages	480	9.00	1.723	13.01	4	0.011
Multitasking	478	8.88	1.565	15.844	4	0.003
Stress and work pressure	478	8.97	1.414	11.573	4	0.021
Lack of rest breaks	479	7.43	2.551	7.737	4	0.102
Pharmacist overwork	477	8.67	1.709	7.511	4	0.111
Cluttered/unorganised dispensary	478	7.50	2.480	3.324	4	0.505
Pharmacist fatigue	476	7.90	2.278	4.796	4	0.309
Inadequately trained staff	477	8.10	2.334	8.087	4	0.088
Distractions	478	8.48	1.784	5.464	4	0.243
Interruptions	479	8.64	1.724	9.604	4	0.048
High prescription volume	476	7.93	2.193	7.668	4	0.105
Clinical services workload	475	7.33	2.365	11.127	4	0.025
Pressure due to waiting patients	479	7.60	2.398	23.276	4	0.000
Similarities in packaging	478	7.98	2.100	4.810	4	0.307
Items placed next to each other on shelf	476	7.23	2.355	2.050	4	0.727
Self-checking	478	7.33	2.724	2.836	4	0.586
Pharmacist working on his/her own	479	7.69	2.817	9.837	4	0.043

6.5.9 Comparison of pharmacy ownership and error prevention strategies

A Kruskal Wallis H test was performed to identify any statistical associations between the type of pharmacy ownership and error prevention strategies. A statistically significant association was observed between three of the fourteen error prevention strategies and type of pharmacy ownership.

A statistically significant association was observed between 'putting in place policies outlining the number of staff required to run each pharmacy safely' and type of pharmacy ownership, $X^2=21.472$, $p<0.000$. An analysis of the mean rank scores for each pharmacy ownership type showed that highest mean ranks were observed for multiple and supermarket pharmacies, whilst independent pharmacies had the lowest mean rank for this variable. A statistically significant association was also observed between 'reducing workloads on pharmacists' and the type of pharmacy ownership, $X^2=12.352$, $p<0.015$. The means ranks indicated that pharmacists working in multiple pharmacies rated 'reducing workloads on pharmacists' more highly than pharmacists working in independent pharmacies.

Finally, a statistically significant association was observed between 'Encouraging employers to create a safer working environment for pharmacists and pharmacy staff' and the type of pharmacy ownership, $X^2=17.878$, $p<0.001$. An analysis of the mean rank scores for each pharmacy ownership type showed that highest mean ranks were observed for multiple and supermarket pharmacies, whilst independent pharmacies had the lowest mean rank for this variable.

Table 37 Differences in error prevention strategies between different pharmacy ownerships

Error prevention strategy	N	Mean	SD	X^2	df	p-value
Having more than one pharmacist on duty	480	6.32	3.080	3.758	4	0.440
Putting in place policies outlining the number of staff required to run each pharmacy safely	477	8.74	1.932	21.472	4	0.000
Improving dispensary support staff training or recruiting dispensary support staff of a higher calibre	480	8.71	1.638	8.254	4	0.083
Putting in place standards for sufficient and regular rest breaks	478	7.81	2.369	4.565	4	0.335
Reducing workloads on pharmacists	480	8.50	1.942	12.352	4	0.015
Greater regulation over promotion and advertisement of community pharmacy services	478	5.78	3.127	2.475	4	0.649
Reducing pharmacists' working hours	478	5.69	3.053	1.950	4	0.745
Managing distractions and interruptions	477	8.27	1.917	2.990	4	0.560
Managing patients' expectations	479	7.83	2.303	2.666	4	0.615
Reducing work pressures	478	8.64	1.725	8.827	4	0.066
Improving the packaging and labelling of drug products	474	8.01	2.219	0.375	4	0.984
Improvements in the physical environment of the dispensary	479	7.54	2.312	2.586	4	0.629
Educating the public about the role of the pharmacist	478	7.29	2.817	1.705	4	0.790
Encouraging employers to create a safer working environment for pharmacists and pharmacy staff.	477	8.75	1.790	17.878	4	0.001

6.5.10 Comparison of pharmacy ownership and likelihood of dispensing errors/near-misses

A Kruskal Wallis H test was performed to identify any associations between the type of pharmacy ownership and dispensing error/near-miss risk/likelihood. A statistically significant association was observed between pharmacy ownership type and near-miss likelihood, $X^2=17.804$, $p<0.001$. An analysis of the mean ranks showed a highest mean rank value for multiple pharmacies, whilst the lowest mean rank was observed for independent pharmacies.

Table 38 Differences in perceptions of error likelihood between different pharmacy ownerships

Dispensing error/near-miss risk/likelihood	X^2	df	p-value
Do you believe that the risk of dispensing errors is increasing or decreasing in community pharmacy?	9.095	4	0.059
Do you believe that actual dispensing errors are becoming more common or less common?	6.041	4	0.196
Do you believe that near-misses are becoming more common or less common?	2.442	4	0.655
According to your experience in community pharmacy, what do you believe is the likelihood of a dispensing error taking place?	6.135	4	0.189
According to your experience in community pharmacy, what do you believe is the likelihood of a 'near-miss' taking place?	17.804	4	0.001

6.5.11 Comparison of pharmacy ownership and working conditions

A Kruskal Wallis H test was performed to identify any associations between the type pharmacy ownership and the working conditions variables. A statistically significant association was observed between thirteen of the twenty one working conditions variables, therefore rejecting the null hypothesis for these variables.

A statistically significant association was observed between pharmacy ownership type and 'there are a sufficient number of staff to manage the workload overall' variable, $X^2=32.884$, $p<0.000$. An analysis of the mean ranks suggests that pharmacists working in multiple pharmacies were more likely to report staff shortages in comparison to pharmacists working in independent pharmacies. The type of pharmacy

ownership and 'I feel that, in current working conditions there is a greater chance of an error taking place' variable were also observed to be statistically significant, $X^2=23.690$, $p<0.000$. The mean ranks indicate that pharmacists working in multiples pharmacies were more likely to perceive a greater likelihood of a dispensing error occurring in current working conditions compared to pharmacists working in independent pharmacies, who were least likely to perceive the occurrence of a dispensing error in current working conditions.

A statistically significant association was also observed between the type of pharmacy ownership and 'the workload that I have to manage at work is more than I consider to be safe' variable, $X^2=27.515$, $p<0.000$. The greatest difference in mean ranks was observed between pharmacists working in multiple pharmacies (who were more likely to report the level of workload they have to manage as unsafe) and pharmacists working in independent pharmacies (who were least likely to report their level of workload as being unsafe).

Similarly, type of pharmacy ownership and 'I am constantly stressed at work' variables also observed to be statistically significant with $X^2=23.036$, $p<0.000$. An analysis of the mean ranks suggests that pharmacists working in multiple pharmacies were most likely to report work stress, whilst pharmacists working in independent pharmacies were least likely to report work stress. The variable 'outside of work, I am constantly stressed' was included to allow a comparison between work-related stress and external stress. The results suggest that external stress was also significantly associated with the type of pharmacy ownership, with pharmacists working in multiple and large chain pharmacies reporting higher levels of external stress in comparison to their counterparts working in independent pharmacies. Testing for differences between the 'providing clinical services is the main cause of work pressure and stress' variable and the type of pharmacy ownership variable revealed a statistically significant association, $X^2=10.491$, $p<0.033$. The greatest difference in mean ranks was observed between pharmacists working in large chain stores (who were most likely to report the provision of clinical services as the main cause of work pressure and stress) and pharmacists working in supermarket pharmacies (who were least

likely to report the provision of clinical services as the main cause of work pressure and stress).

A statistically significant association was observed between the type of pharmacy ownership and 'expectation to reach company targets is the main cause of work pressure and stress' variables, $X^2=34.305$, $p<0.000$. An analysis of the mean ranks suggests that pharmacists working in large chain pharmacies were most likely to report work pressures and stress associated with company targets, whilst pharmacists working in independent pharmacies were least likely to report work pressure and stress associated with company targets.

Testing the 'dispensing of medicines is what I like best about my job' and 'providing clinical services is what I like best about my job' variables against the type of pharmacy ownership both revealed statistically significant associations, with $X^2=9.496$, $p<0.050$, and $X^2=12.410$, $p<0.014$ respectively. An inspection of the mean ranks revealed that pharmacists working in independent pharmacies were more likely to agree with the statement, 'dispensing of medicines is what I like best about my job', whilst pharmacists working in supermarket and large chain pharmacies ranked almost equally and were least likely to agree with the 'dispensing of medicines is what I like best about my job' statement. However, analysis of the mean ranks indicated that pharmacists working in multiple pharmacies were most likely to agree with the statement 'providing clinical services is what I like best about my job' whereas pharmacists working in independent pharmacies were least likely to agree with this statement.

A statistically significant association was also observed between the variables 'I feel I have sufficient rest breaks (mental and physical) during my working day' and 'taking a rest break when I feel overworked tends to be frowned upon' and pharmacy ownership type. The independent samples Kruskal Wallis H test gave values of $X^2=23.497$, $p<0.000$ and $X^2=15.899$, $p<0.003$ respectively. The mean ranks indicate that pharmacists working in multiple pharmacies were least likely to agree with the statement 'I feel I have sufficient rest breaks (mental and physical) during my working

day', whereas pharmacists working in independent pharmacies were most likely to agree with this statement. Similarly, an analysis of the mean ranks further indicates that pharmacists working in multiple pharmacies were most likely to agree with the statement 'taking a rest break when I feel overworked tends to be frowned upon', whereas pharmacists working in independent pharmacies were least likely to agree with this statement. Testing 'there is adequate seating available to sit on if needed' and the type of pharmacy ownership variable also yielded a statistically significant association with $X^2=10.675$, $p<0.030$. The mean ranks indicate that pharmacists working in large chain pharmacies were least likely to agree with the statement 'there is adequate seating available to sit on if needed' whereas pharmacists working in small chain pharmacies were most likely to agree with the statement.

The variable 'I have to compromise my professional autonomy in order to maintain good relationships with my senior manager/colleagues' was also tested against the type of pharmacy ownership variable to identify any differences. The independent samples Kruskal Wallis H test revealed a significant difference with $X^2=17.066$, $p<0.002$. The mean ranks indicate that pharmacists working in independent pharmacies were least likely to agree with the statement 'I have to compromise my professional autonomy in order to maintain good relationships with my senior manager/colleagues', whereas pharmacists working in large chain pharmacies and multiples were most likely to agree with this statement.

Finally, a statistically significant association was also observed between 'overall, I am satisfied with my job' and type of pharmacy ownership, with $X^2=21.778$, $p<0.000$. An analysis of the mean ranks suggests that pharmacists working in independent pharmacies were most likely to agree with the statement 'overall, I am satisfied with my job', whereas pharmacists working in large chain and multiple pharmacies were least likely to agree with this statement.

Whilst not meeting criteria for statistical significance, the 'outside of work, I am constantly stressed' and 'the volume of medicines to be dispensed is the main cause of work pressure and stress' variables revealed an association trending towards

statistical significance, with $X^2=8.772$, $p<0.067$ and $X^2=9.440$, $p<0.051$ respectively. The mean ranks of the external stress variable indicate that pharmacists working in independent pharmacies expressed least agreement to external stress, whilst pharmacists working in large chain pharmacies and multiples expressed highest level of agreement to the external stress statement. A marginally significant association was observed between 'the volume of medicines to be dispensed is the main cause of work pressure and stress' and the type of pharmacy ownership. Pharmacists working in supermarket pharmacies expressed least agreement with this statement whereas pharmacists working in multiple pharmacies expressed a highest level of agreement with this statement.

Table 39 Differences in working conditions between different pharmacy ownerships

Working condition	X^2	df	P value
I feel I work longer hours than I consider to be safe	7.367	4	0.118
I feel that the dispensary support staff work longer hours than I consider to be safe	4.487	4	0.344
There are a sufficient number of staff to manage the workload overall	32.884	4	0.000
The staff I work with are adequately trained for their roles in the dispensary	7.836	4	0.097
In the event of a dispensing error, the dispensary staff are willing to learn from the incident	2.412	4	0.660
I feel that, in current working conditions there is a greater chance of an error taking place	23.690	4	0.000
The workload that I have to manage at work is more than I consider to be safe	27.515	4	0.000
I am constantly stressed at work	23.036	4	0.000
Outside of work, I am constantly stressed	8.772	4	0.067
The volume of medicines to be dispensed is the main cause of work pressure and stress	9.440	4	0.051
Providing clinical services is the main cause of work pressure and stress	10.495	4	0.033
Expectation to reach company targets is the main cause of work pressure and stress	34.305	4	0.000
Unrealistic patient expectations are the main cause of work pressure and stress	5.596	4	0.231
Dispensing of medicines is what I like best about my job	9.496	4	0.050
Providing clinical services is what I like best about my job	12.410	4	0.014
I feel I have sufficient rest breaks (mental and physical) during my working day	23.497	4	0.000
Taking a rest break when I feel overworked tends to be frowned upon	15.899	4	0.003
There is adequate seating available to sit on if needed	10.675	4	0.030
I feel I can easily make decisions using my professional judgement	2.143	4	0.710
I have to compromise my professional autonomy in order to maintain good relationships with my senior manager/colleagues	17.066	4	0.002
Overall, I am satisfied with my job	21.778	4	0.000

6.6 Discussion

The aim of this quantitative study was to investigate predictors of dispensing errors in community pharmacy. Due to time limitations, the researcher could only conduct an in-depth analysis of pharmacy ownership type as a predictor of dispensing errors in community pharmacy. The findings of this study suggest that pharmacists' perceptions of dispensing error contributory factors, error prevention strategies and working conditions may vary depending on the type of pharmacy ownership. These findings are compatible with the findings of an earlier qualitative study which highlighted the deteriorating working conditions – thought to be arising due to underlying corporatisation of community pharmacy, to the occurrence of dispensing errors. The findings of this study have enhanced our understanding of the issues raised in the earlier qualitative phase of this research.

This study has found that the majority of community pharmacists in this sample believed that the risk of dispensing errors in community pharmacy was increasing, whilst almost three fifths believed that actual dispensing errors were also becoming more common. Similarly, the majority of community pharmacists in this study also believed that near-misses were becoming more common. This is in keeping with previous research which suggests that escalating workloads, and work pressures may be precipitating working conditions in which the likelihood of a dispensing error taking place may be increasing (Gidman, 2011, *Gidman et al.*, 2007, *Hassell et al.*, 2011, *Johnson et al.*, 2014, *McCann et al.*, 2009a). However, the findings of this quantitative study have added a new dimension to an ongoing discussion about dispensing errors in community pharmacy. This study found a statistically significant association between the type of pharmacy ownership and the pharmacists' opinion of the likelihood of near-miss occurrence, with pharmacists working in multiple pharmacies reporting the highest likelihood of near-miss occurrence, whilst pharmacists working in independent pharmacies reporting the least likelihood of dispensing error occurrence. Furthermore, this study also found that pharmacists working in multiple pharmacies were more likely to perceive a greater likelihood of a dispensing error occurring in current working conditions compared to pharmacists working in

independent pharmacies, who were least likely to perceive the occurrence of a dispensing error in current working conditions. These findings suggest that working conditions in the different types of pharmacy ownership may be a factor mediating varying perceptions of dispensing error occurrence.

Whilst the majority of community pharmacists believed that the likelihood of dispensing errors ranged from unlikely (1 error per month) to somewhat likely (1 error per week), over three fifths of pharmacists in this study believed that near-misses were extremely likely (several near-misses per day). Given that the majority of community pharmacists believed that the likelihood of dispensing errors ranged from unlikely (1 error per month) to somewhat likely (1 error per week), this gives an overall average rate of dispensing errors ranging from 1 to 4 errors per month. These findings complement previous research which suggests that dispensing errors occur at a rate of 4 per 10000 items dispensed (Ashcroft et al., 2005). Given that the average number of prescription items dispensed per month between the years 2015 and 2016 was 7096 (Health and Social Care Information Centre, 2016a), applying a rate of 4 errors per 10000 items to the average monthly prescription volume of 7096 gives a rate, on average, of 2.83 dispensing errors per month per pharmacy, which falls within the range identified by the present study.

This study investigated three key areas in relation to dispensing errors in community pharmacy: contributory factors of dispensing errors, dispensing error prevention strategies, and working conditions. Variables associated with each key area of investigation was tested against the type of pharmacy ownership variable to identify associations of statistical significance. This study found that the issue of staff shortages consistently showed statistical significance with the type of pharmacy ownership variable across all three areas of this study. Pharmacists working in multiple pharmacies were statistically more likely to rate staff shortages as a contributory factor to dispensing errors, whereas pharmacists working in independents pharmacies were statistically least likely to rate staff shortages as a contributory factor of dispensing errors. Likewise, an association of a similar fashion was observed for error prevention strategies and working conditions, with pharmacists working in

multiple pharmacies rating the need for staffing policies more highly compared to pharmacists working in independent pharmacies, and pharmacists working in multiples identifying staff shortages as a key issue in the working conditions section. These findings are complementary to the earlier qualitative phase of this research where low staffing levels emerged as a prominent sub-theme of working conditions. These findings are also in keeping with previous research which suggest that understaffing in community pharmacy may be associated with dispensing error occurrence (Ashcroft et al., 2005, Flynn et al., 2002, James et al., 2009, Peterson et al., 1999). However, the present study enhances our current understanding of staffing issues in relation to dispensing errors as it suggests that the issue of staffing levels may vary according to the ownership type of the pharmacy.

The issue of inadequately trained dispensary support staff is also one that has been highlighted in dispensing error research (Ashcroft et al., 2005, James et al., 2009). It was also identified as a key sub-theme of working conditions in the qualitative phase of this research. However, whilst the present study could not find a statistically significant association between staff training the pharmacy ownership variables in all three areas of the study, an association trending towards statistical significance was consistently observed in all three areas. The pattern of differences between the different pharmacy ownerships followed a fashion where inadequately trained staff were least associated with independent and small chain pharmacies in all three areas of the study, and most associated with the larger chain pharmacies, or supermarket pharmacies.

The issue of escalating workloads in community pharmacy is one that has been highlighted numerously since the implementation of the contractual changes of 2005, particularly in relation to patient and pharmacist safety (Eden et al., 2009, Gidman, 2011, Gidman et al., 2007, Hassell et al., 2011, Lea et al., 2012, Schafheutle et al., 2011). Escalating workloads was also identified as a key theme in relation to dispensing errors in the previous qualitative study. The present study found a statistically significant association between increasing levels of workload and the type of pharmacy ownership in all three areas of the study. Whilst dispensing workload and

the type of pharmacy ownership did not yield a statistically significant association in the contributory factors of dispensing errors areas of the study, clinical services workload did show a statistically significant association. Pharmacists working in independent pharmacies were least likely to associate a high clinical services workload to the occurrence of dispensing errors, whereas pharmacists working in multiple pharmacies were most likely to associate a high clinical services workload to the occurrence of dispensing errors. Similarly a statistically significant association was also observed between reducing pharmacist workloads and the type of pharmacy ownership in the error prevention strategies areas of the study. Once again, a similar pattern was observed where pharmacists working in multiple pharmacies were more likely to give a higher rating for this strategy, whereas pharmacists working in independent pharmacies were least likely to give a high rating. These findings, combined with the findings of the qualitative study suggest that workload within the community pharmacy context may be ill-defined at present. In the past, high prescription volumes and dispensing-related tasks have been taken as the primary definition constituting high workload. However, this research has found that an increasing range of functions that now form a part of the pharmacist's role, e.g. the provision of clinical services must also be taken into consideration when investigating workload in community pharmacy. The findings of the present study suggest that workload levels may vary according to the type of pharmacy ownership.

In recent years, there has been a growing concern about the levels of stress and work pressures experienced by community pharmacists, and how these may be adversely impacting patient and pharmacist safety (Eden et al., 2009, Gidman et al., 2007, Hassell et al., 2011, Johnson et al., 2014). This study found that stress and work pressures was the second most highly rated contributory factor. Furthermore, a statistically significant association between stress and work pressures and the type of pharmacy ownership in the contributory factors and working conditions areas of the study. Whilst not meeting the criteria for statistical significance, an association trending towards statistical significance was also observed for 'reducing work pressures' in the error prevention area of the study. In line with findings mentioned above, pharmacists working in multiple and large chain pharmacies were more likely to report higher levels

of work and external stress in comparison to pharmacists working in independent and small chain pharmacies. In keeping with the study conducted by Jacobs et al. (2014), the findings of this study have enhanced our current understanding of stress and work pressures by highlighting that stress and work pressures may vary according to the type of pharmacy ownership.

A target-driven culture to provide clinical services is also one that has emerged as a source of work stress and pressure (Jacobs et al., 2014, Johnson et al., 2014). The results of the present study as well as those of the earlier qualitative phase have highlighted a target-driven culture to provide clinical services and dispensing of medicines. This study found a statistically significant association between target-driven culture and the type of pharmacy ownership. Pharmacists working in multiple pharmacies gave a highest rating for stress arising due to a target-driven culture in comparison to their counterparts working in independent pharmacies. Furthermore, analysis of the open-ended questions too revealed allegations of bullying and unsupportive approaches taken by some of the multiple and larger chain pharmacies to pressurise pharmacists to achieve targets. These findings support growing concerns about a target-driven culture prevalent in community pharmacy, resulting in pharmacists having to sacrifice professional ethics in order to avoid hostility from managers and employers.

It is of note also that a significant difference was observed between pharmacists working in multiple and large chain pharmacies and those working in independent pharmacies as to how they rated the error prevention strategy 'encouraging employers to create a safer working environment for pharmacists and pharmacy staff'. Perhaps the fact that pharmacists working in multiple and large chain pharmacies gave a higher rating for this strategy is an indication that working practices vary according to the type of pharmacy ownership, with larger corporate pharmacies being more prone to unsafe working environments/practices. Furthermore, statistically significant differences were also observed in job satisfaction according to pharmacy ownership. Job satisfaction was observed to be highest amongst pharmacists working in independent pharmacies and small chain pharmacies, and least in multiple and large chain pharmacies. Whilst

previous research has highlighted reducing levels of job satisfaction in community pharmacy (Lea et al., 2012, McCann et al., 2009b), this study adds to our current understanding by showing that levels of job satisfaction may vary according to the type of pharmacy ownership.

The findings of this study are alluding to an overarching theme that has become apparent in this research project; the issue of corporatisation of community pharmacy in relation to the occurrence of dispensing errors. This study has found that as the level of corporatisation increases in accessions as defined by Bush et al. (2009), pharmacists' perceptions of near-miss likelihood also increases. This finding may be backed by the fact that pharmacists in larger corporates reported poorer working conditions, and demonstrated a consistency in associating these factors to the contributory factors of dispensing errors, and highlighted these issues as error prevention strategies.

6.6.1 Strengths and limitations

This is the first study to investigate the type of pharmacy ownership as a predictor of dispensing error occurrence, and to compare how working conditions may vary according to pharmacy ownership type. Furthermore, this the first study to show the effects that corporatisation of community pharmacy can have on the perceived occurrence of dispensing errors. The study benefited from having a minimal missing data rate of 0.8%. The proportion of male and female pharmacist in this survey mirrored very closely with the national average for community pharmacy (Hassell et al., 2011).

However, a number of important limitations of the study must also be considered. Perhaps the biggest limitation for this study has been time. Due to time limitations, the researcher could only conduct three recruitment rounds, which proved to be an important causal element of the low response rate. Furthermore, time limitations also meant that an in-depth analysis could only be conducted for one predictor of dispensing errors; pharmacy ownership. Given further time, an in-depth analysis could have been conducted for age, sex, job role and ethnicity.

Perhaps, and as a result of limited time, a major drawback of this study has been the low response rate, which was just 4%. Such low response rate can have a number of implications on the findings of this study. First, the data may be associated with 'non-response' bias which means that there may be distinct differences between the respondents and non-respondents of the survey (Delgado-Rodríguez and Llorca, 2004). This introduces a systematic non-representation as the non-respondents may be similar in their tendency to not respond. Furthermore, a low response rate means that findings of this research study must be interpreted with caution and therefore not generalisable to the wider population of community pharmacists.

Furthermore, a significantly larger number of older pharmacists took part in the survey; over two fifths of respondents were aged 50 years and over. However this is in contradiction with the national average, where pharmacists aged 50 years and above make up 23.8% of all registered pharmacists (Hassell, 2011). Therefore the findings of this study sample may be biased towards the older pharmacists, whose longer experience in pharmacy may mean their views differ to the rest of the pharmacist population. The reasons for a relatively lower response rate overall, and from younger pharmacists is unclear. Perhaps time limitations due a larger proportion of younger pharmacists working on a full-time basis in comparison to older pharmacists may be a reason for lower response rate from younger pharmacists. Furthermore, previous research has highlighted a lack of engagement of community pharmacists in research and time limitation have been shown to be an important factor in preventing pharmacists from taking part in research (Rosenbloom et al., 2000).

6.7 Conclusion

This study employed a quantitative survey methodology to investigate pharmacy ownership as a predictor of dispensing errors in community pharmacy. The findings of this study suggest that working conditions vary at different levels of corporatisation. Large corporate and multiples were shown to be associated with poorer, more-error prone working conditions, whilst smaller chain and independent pharmacies were shown to be associated with relatively better, less error-prone working conditions.

However, further research is required to carry out more robust studies in different pharmacy ownerships to characterise the relationship between the type of pharmacy ownership and dispensing error occurrence.

Chapter 7

Discussion

7.1 Introduction

This doctoral research sought to examine the occurrence of dispensing errors in community pharmacy and investigate the role of the community pharmacist in ensuring accuracy and clinical safety during the dispensing process. In order to achieve this aim, a mixed methods approach was employed to conduct the research. The community pharmacy landscape has changed considerably over the past twenty to thirty years, and the current scenario suggests that it will continue to do so. For example, the profession underwent major contractual changes in 2005 in an attempt to re-professionalise pharmacy. The past two decades have also seen an uncharacteristic increase in the number of corporate and large chain pharmacies. In recent years there has also been a growing interest in dispensing error research. However, a large body of dispensing error research originates from secondary care or from outside the UK. Furthermore, dispensing error research has largely been confined to self-report and observational methods, which report errors that are detected before they reach the patient (near-misses). Previous research has taken a generic approach to investigate the occurrence of dispensing errors and has mainly reported the types and causes of dispensing errors in community pharmacy. This PhD research was therefore necessary to address the gaps in literature, specifically regarding a profile of actual dispensing errors in community pharmacy, the contributory factors, the outcome of dispensing errors for patients and pharmacists, and the predictors of dispensing errors in community pharmacy.

This chapter will summarise the key findings of this PhD research project, compare findings from each of the three studies, and discuss how they integrate with each other and relate to the existing literature. Methodological considerations will be presented, along with implications for policy, practice and future research.

7.2 Summary of findings

7.2.1 Literature review

The aim of the literature review was to investigate the incidence, types and causes of dispensing errors in community pharmacy. Previous research has largely investigated the causes of dispensing errors including the effects of workload, interruptions and distractions, LASA drugs, sound, light, work pressures, stress and staffing issues. However, previous research has mainly investigated the causes of dispensing errors in isolation and not part of an integrated pharmacy system. Furthermore, a substantial number of studies investigating the causes of dispensing errors have been conducted in the US, therefore not directly applicable to the UK pharmacy context due to varying health service models.

A gap in the literature was found regarding the outcome of dispensing errors, for patients as well as the pharmacist, with very little research having been conducted in the UK or internationally. A further gap in the literature was found regarding the experiences of pharmacists during a dispensing error and the impact of dispensing errors on the pharmacist's work and personal life, their dispensing practice, or their well-being. Whilst a number of research studies have investigated issues such as escalating workloads and stress and work pressures in UK community pharmacy, previous research has taken a generic approach to understanding these issues. At present there have been no studies carried out to investigate the impact of workloads, stress and work pressure and working conditions specifically in relation to dispensing errors in community pharmacy.

7.2.2 Retrospective database analysis

The aim of the retrospective study was to examine the nature and outcome, and identify possible explanations for error occurrence.

The study found that over a quarter of the dispensing errors did not have a final accuracy check performed. The quantitative and qualitative studies consistently found

high workloads/busier than normal, staff shortages, and fatigue/no rest breaks amongst the top contributory factors. The study also found associations between the number of hours worked on the day of the error, the monthly prescription volume, the total number of staff present at the time of the error and the amount of time taken for rest breaks and the risk associated with the error. Insufficient staff, busier than normal/high workload, prescription volume on the day of the error, self-checking and fatigue/no rest breaks were found to be circumstances that reduced the likelihood of the pharmacist performing a final check on the dispensing item. The findings of the study also indicated that pharmacy location/type was a significant factor in determining whether the final accuracy check was performed on the dispensed item.

7.2.3 Qualitative study

The aim of the qualitative study was to explore the perceptions and experiences of pharmacists following a dispensing error and the impact that the occurrence of a dispensing error has on a pharmacist's practice.

The findings indicated that several factors were important in order to understand the occurrence of dispensing errors in community pharmacy including; gaining an understanding of working conditions in community pharmacy; understanding and defining the role of the community pharmacist and; understanding the experiences and attitudes of pharmacists towards dispensing errors. A business-driven approach towards the provision of pharmaceutical services and patient care was identified to be a key driver in deteriorating working conditions in community pharmacy, increasing the likelihood of dispensing errors occurring. Efforts for role expansion in an increasingly corporate and commercial pharmacy environment was found to obscure public and dispensary support staff understanding of the role of the pharmacist, ultimately undermining the pharmacist's ability to exercise discretion where they see fit. The study also shed light on a highly under-researched but important area; the impact that dispensing errors can have on a pharmacist's work and personal life and dispensing practice. The study found that pharmacists perceive a high burden of responsibility towards their work, and as a result, the occurrence of a dispensing error was found to have strong, and in some cases, lasting physical, emotional and

psychological responses in pharmacists, reducing pharmacists' confidence in their abilities and, for a minority, inducing a substantial impact on pharmacist's health and wellbeing, their personal relationships, and their careers.

The findings of the qualitative study highlight the conflicting imperatives arising from the dual role of pharmacists both as a healthcare provider, and as an operative of a profitable business, which in turn play a crucial role in creating error-prone environments.

7.2.4 Cross-sectional survey

The aim of this study was to investigate and identify contributory factors and predictors of dispensing errors, pharmacists' working conditions as well as their opinions of error prevention strategies. However, time limitations meant that an in-depth analysis could only be conducted for 'the type of pharmacy ownership' as a predictor of dispensing errors in community pharmacy.

The survey data obtained in this study is suggestive of poor working conditions in community pharmacy, with pharmacists reporting staff shortages, high workloads both in terms of dispensing of medicines as well as the provision of clinical services, higher levels of stress and work pressures associated with a target-driven approach to the provision of clinical services, insufficient rest breaks and compromised professional autonomy. The findings of the study are alluding to the idea that working conditions in community pharmacy may be a symptom of the different levels of corporatisation. Large corporate and multiples were shown to be associated with poorer, more-error prone working conditions, whilst smaller chain and independent pharmacies were shown to be associated with relatively better, less error-prone working conditions.

7.3 Comparison of findings and relationship to existing literature

There have been two key elements of focus in this doctoral research; the nature and causes of dispensing errors in community pharmacy and the impact and significance of dispensing errors on patient safety as well as pharmacist safety and wellbeing. Both aspects will be addressed in this discussion.

The literature review found a gap in knowledge regarding the occurrence of dispensing errors. Studies investigating dispensing errors in UK community pharmacies dated to pre-contractual changes of 2005 (Ashcroft et al., 2005, Chua et al., 2003) or just shortly after the implementation of the contractual framework (Franklin and O'Grady, 2007). Since the contractual changes were an endeavour to shift the role of the community pharmacist away from the supply function and towards a new health-orientated and care focussed paradigm, it was unclear how the dynamics of dispensing errors occurring were changing amidst role expansion. Furthermore, existing research about dispensing errors has either employed an observational approach (where errors are identified and recorded prior to supplying the medicines) or self-reporting approaches which have been unable to gather a large enough dataset for dispensing errors in specific. For example, a prospective study carried out by Ashcroft et al. (2005) reports the findings of 50 dispensing errors, whilst the study conducted by Chua et al. (2003) reports the findings of 39 dispensing errors.

The retrospective database analysis study investigated dispensing errors that took place after the implementation of the contractual changes of 2005, dating between June 2006 and December 2013. Furthermore, the study benefitted by presenting a profile of actual dispensing errors using a large dataset (n=706 dispensing errors). Whilst the study shed light on various aspects of dispensing errors, the findings highlighted that certain circumstances could precipitate conditions which can reduce the likelihood of pharmacists performing a final accuracy check on a dispensed prescription item. These included pharmacy type/location, insufficient staff, being

busier than normal/high workload, prescription volume, self-checking and fatigue/no rest breaks.

In keeping with previous literature, the issues of high workload, staff shortages and insufficient rest breaks were highlighted in all three phases of this research project (Ashcroft et al., 2005, Flynn et al., 2002, Gidman, 2011, Gidman et al., 2007, Hassell et al., 2011, Peterson et al., 1999, Schafheutle et al., 2011). The findings of this research project suggest that escalating workloads in community pharmacy may be a key contributory factor of dispensing errors in community pharmacy. Furthermore, this thesis has highlighted that workload in community pharmacy lacks definition. Whilst the bulk of previous literature has reported increasing workloads in community pharmacy primarily in objective measures of prescription workload, the findings of this research suggest that an increased range of functions carried out as a result of role expansion often go overlooked. Moreover the findings of this thesis indicate that high, and often unreasonable levels of workload, arising primarily due to an increasingly business-driven culture in community pharmacy may be having an adverse impact on the pharmacists' ability to ensure accuracy during the dispensing process. As a result, these factors may be a driver in creating working environments which increase the likelihood of dispensing errors occurring, thereby impinging not just the safety of patients but also the health and safety of community pharmacists.

Staff shortages is another key factor consistently found in all three phases of this research to be contributing to dispensing errors. Previous research has reported reducing staffing levels in community pharmacy (Blenkinsopp et al., 2009). Low staffing levels create environments that increase the burden on the pharmacist and, as identified in the retrospective database study, reduce the likelihood of a pharmacist performing a final check. This research has identified that an adequate level of dispensary support staff is essential to ensure a safe effective running of the dispensary. The issue of insufficient rest breaks was also one that consistently emerged in all three phases of this research project. Fatigue/insufficient rest breaks was found to be a key contributory factor of dispensing errors in community pharmacy. The qualitative study and cross-sectional survey found that a prevalent culture in

community pharmacy that either, does not entitle pharmacists to take a rest break, or where pharmacists choose to work through rest breaks in pursuit of financial gain.

The findings of the qualitative study complemented the findings of the earlier retrospective database analysis by identifying two key themes in relation to the occurrence of dispensing errors; working conditions in community pharmacy; and the role of the community pharmacist. Whilst the retrospective database study showed how each factor can relate, in isolation, to the occurrence of dispensing errors, the qualitative study highlighted how each factor was part of an interdependent and interlinked system. In doing so, the qualitative study portrayed each contributory factor as a subset of the collective working conditions in community pharmacy. These findings fit with the sociotechnical model of organisational development which views the relationships between the social, psychological and technical elements of a work system collectively as being interlinked and interdependent, and constantly in interaction with one another. Therefore in order to fully understand the occurrence of dispensing errors in community pharmacy, a holistic approach is necessary to understand how the various elements of the system interplay with one another during the occurrence of a dispensing error.

A latent theme was found to be interwoven in all three phases of this doctoral research; the issue of corporatisation of community pharmacy in relation to dispensing errors. Whilst previous research has been able to highlight the issue of deteriorating working conditions in community pharmacy (Eden et al., 2009, Gidman, 2011, Gidman et al., 2007, Hassell et al., 2011, Johnson et al., 2014, McCann et al., 2009a, McCann et al., 2009b), there has yet been no evidence to suggest that corporatisation of community pharmacy may be an important mediator of these changes. The combined findings of all three phases of this research project are alluding to an underlying corporatisation of community pharmacy. The cross-sectional survey showed that type of pharmacy ownership may be a predictor of dispensing errors. As the level of corporatisation increased, working conditions deteriorated, creating error-prone environments. In order to maximise economy, efficiency and competition, corporate organisations seek to deliver services in a standardised and rationalised manner, whilst placing an

emphasis on cost-reduction (Bush et al., 2009, Taylor et al., 2004). Viewing the approach to pharmacy services taken by large corporates through the sociotechnical lens indicates that limiting resources in either of the elements of the sociotechnical model disrupts the entire system. As highlighted through this research, corporatisation of community pharmacy is associated with limiting technical resources, whilst maximising output, for example, reducing staffing levels whilst maximising workload. Doing so creates a disruption at all the levels of the sociotechnical model, and therefore rendering error-prone environments.

The second element of focus in this research has been the outcome of the dispensing errors for both patients and pharmacists. Previous literature regarding these aspects of dispensing errors is scarce. This research project has been able to show that whilst over half of the dispensing errors in the retrospective database study resulted in no harm to the patient, in over two fifths of cases, the patient suffered from minor to moderate harm. Given also that in over three quarter of cases, the patient ingested at least one dose of the incorrectly dispensed medicine, the potential for a greater level of harm arising as a result of dispensing errors is present.

This research has also highlighted the considerable impact that the occurrence of dispensing errors can have on some pharmacists. The literature review found this to be a highly under-researched area. This research has found that in the current working conditions community pharmacists perceive a high burden of responsibility towards their role, which for some has been shown to have a substantial, and in some cases lasting impact on pharmacists' physical and mental health. However once a dispensing has occurred, pharmacists experience short-term and long-term physical, emotional and psychological effects. The retrospective database study and the qualitative study both showed that the occurrence of a dispensing error can undermine pharmacists' confidence in their abilities in the short-term. Whilst a majority of pharmacists are able to identify dispensing errors as critical points of learning to instil caution and diligence in their work, for a minority the occurrence of a dispensing error can have a detrimental effect on their physical and mental health as well as their pharmacy careers.

7.4 Implications for policy, practice and future research

The research evidence presented in this thesis offers an insight into the various approaches that can be taken to develop solutions to reduce the occurrence of dispensing errors in community pharmacy. The broad conclusions drawn from this project have implications for both the practice, policy and regulation of pharmacists and pharmacy services and future research. However, future investigations are necessary to validate the conclusions that can be drawn from this study.

As mentioned earlier, and in keeping with previous research, deteriorating working conditions in community pharmacy – which appear to be an amalgamation of increasing workloads, inadequate staffing levels, inadequately trained dispensary support staff and insufficient rest breaks, is an overarching theme that became apparent in all phases of this research. Specifically, pharmacists in the qualitative study also expressed their disappointment over a lack of response from the pharmacy regulator over the deteriorating and unsafe working conditions in community pharmacy. However, at present, further research evidence is necessary to substantiate the premise that deteriorating working conditions in community pharmacy is undermining pharmacists' ability to ensure accuracy during the dispensing process. Furthermore, future research could explore the differences in working conditions in different pharmacy ownerships, and therefore illustrate the impact that corporatisation is having on the working conditions in community pharmacy. Taken together, these findings support my recommendation to impose tougher regulation of pharmacies/employers to create a safer working environment for pharmacists and pharmacy staff.

In keeping with previous research, this thesis found that escalating levels of workload may be a factor associated in undermining pharmacists' ability to ensure accuracy throughout the dispensing process. A reasonable approach to tackle this issue could be to manage workload either by introducing a safe dispensing limit in the UK and/or by having two pharmacists per pharmacy. These proposals can be backed by the

original research presented in this thesis whereby 82% of pharmacists in the cross-sectional survey believed that there should be a safe dispensing limit in the UK. Furthermore, the mean number of prescriptions that pharmacists believed could be safely dispensed per day (9am-6pm) by/in the presence of one pharmacist with no dispensary support staff was 134. Additionally, over half of the participants in the qualitative research interviews suggested putting in place a second pharmacist per pharmacy as the most viable approach to overcoming the issue of escalating workloads in community pharmacy. Another approach to tackling escalating levels of workload may be to redesign remuneration structures such that reimbursement is based on quality of services as opposed to quantity. However, at this stage more research needs to be undertaken before the association of workload and the occurrence of dispensing errors can be more clearly understood and characterised. Therefore a natural progression would be to design a prospective instrument that can be used to gather data on dispensing errors in community pharmacy and subsequently investigate the occurrence of dispensing errors in high and low prescription volume pharmacies. Further research could also examine relationship between clinical services workload and dispensing error occurrence.

The findings of this research suggest that there is a shortage of support staff in community pharmacy. Pharmacists in the qualitative study and the survey highlighted that staff shortages is a key contributory factor of dispensing errors and highlighted it as a key error prevention strategy. An implication of these findings would be to develop effective strategies to ensure adequate staffing levels. This may be achieved through putting in place policies outlining the number of staff required to run each pharmacy safely, or as one survey respondent suggested, having available relief dispensers either from internal or external sources for example, locum dispensers. It is important to note however, that staffing levels in community pharmacy is a highly under-researched area. Future research efforts are needed to gaining a deeper understanding of staffing levels in community pharmacy and examine more closely the link between staff shortages and the occurrence of dispensing errors in community pharmacy.

Similarly, the issue of inadequate dispensary support staff training is one that has repeatedly emerged throughout this research. To date, only a limited amount of previous research has investigated dispensary support staff training and skill-mix in community pharmacy, and of that, no prior research has examined the link between dispensary support staff training and the occurrence of dispensing errors in community pharmacy exists. The findings of this research project have illustrated a raised concern amongst community pharmacists that dispensary support staff were not adequately trained enough to fulfil their role in the dispensary and that current training courses has been degraded over the years to simple tick box exercise. In light of these findings, a reasonable approach to tackle this issue would be to ensure a more firm regulation of dispensary support staff training. However, the issue of dispensary support staff training is one that could be explored further. A possible approach to researching this further could to be compare the rates of dispensing error occurrence in community pharmacies with different levels of skill-mix amongst the dispensary support staff team.

The findings of this research project suggest that escalating levels of workload and the commercialisation of community pharmacy services by employers – where there is an expectation by employers for pharmacists to work through the rest breaks in an effort to maximise efficiency and output, have precipitated a prevalent culture of insufficient rest breaks. At present previous literature investigating working practices, specifically the issue of rest breaks in community pharmacy is scarce. As such, the premise that insufficient rest breaks may be factor influencing the occurrence of dispensing errors is still in its infancy, and thus warrants further investigation. It would be a useful approach first to investigate the prevalence of community pharmacists not taking a rest break, and then to examine and characterise the relationship between insufficient rest breaks and the occurrence of dispensing errors. Nonetheless, a key policy priority could be to ensure that employers allow community pharmacists to take sufficient and regular rest breaks as entitled through the worker's rights by UK law.

A latent theme apparent across all stages of this research project has been the issue of corporatisation of community pharmacy. Due to the limitations associated with this

research, it is necessary to exercise caution when interpreting the findings. Furthermore, due to the fact this is the first study that has shed light on this issue, our understanding of how corporatisation of community pharmacy has changed the community pharmacy landscape is still limited. However, the issue of corporatisation of community pharmacy and its impact on working conditions and the occurrence of dispensing errors is an intriguing one which could be usefully explored in further research. This would then substantiate any possible policy proposals looking to encourage a mixed range of pharmacy ownership through effective regulation and control.

7.5 Strengths and limitations

This project employed a mixed methods approach to investigate the occurrence of dispensing errors in community pharmacy. By using a mixed methods approach, the weaknesses associated with each of the qualitative and quantitative approaches could be compensated by each method's strengths.

The retrospective database study gathered a large dataset of IRFs and continued sampling the study reached a point of saturation. Furthermore the quantitative findings of the study were backed and given meaning through the qualitative analysis of the IRFs. The qualitative study benefitted from recruiting pharmacists from a large geographic area, and so represent a rich and diverse group of pharmacists. Furthermore, the qualitative study was informed by the findings of the retrospective database study. In the same way, the cross-sectional survey was informed by the findings of the qualitative study. In doing so, each phase of research was grounded and tested in theory.

There were however, several limitations to the research project. Firstly, the retrospective database study was an arduous and time-consuming task as the researcher had to sift through individually all dispensing error cases to identify those that met the inclusion criteria. This caused delays in data analysis and subsequently

delayed data collection of the qualitative study. Trouble recruiting participants for the qualitative study created a further delay.

Also, one of the limitations of the qualitative study was the fact that a majority of participants were employees of a large multiple, which added a bias to the study. Similarly, there is a potential for bias in the cross sectional study due to a disproportionately larger number of older pharmacists in the sample of respondents. Due to time limitations more pharmacists could not be recruited to take part in the survey which ultimately meant a small study sample.

7.6 Conclusion

This programme of work has investigated the occurrence of dispensing errors in community pharmacy and had examined the role that community pharmacist play in ensuring accuracy during the dispensing process. A mixed methods approach underpinned by pragmatism was employed to explore the occurrence of dispensing errors in community pharmacy as well as the experiences and attitudes of community pharmacists towards dispensing errors. The research found that deteriorating working conditions in community pharmacy are a key factor in producing error-prone environments in community pharmacy. Increasing levels of corporatisation in community pharmacy is undermining pharmacists' professional discretion. The findings of this research suggest that the type pharmacy ownership may be a predictor of dispensing errors in community pharmacy and increasing levels of corporatisation may be associated with an increased likelihood of dispensing errors taking place.

References

- AL-ARIFI, M. N. 2014. Community pharmacists' attitudes toward dispensing errors at community pharmacy setting in Central Saudi Arabia. *Saudi Pharmaceutical Journal : SPJ*, 22, 195-202.
- ALLWOOD, C. M. 2012. The distinction between qualitative and quantitative research methods is problematic. *Quality & Quantity*, 46, 1417-1429.
- ANDALO, D. 2016. Similar branding partly blamed for 'devastating' dispensing error. *The Pharmaceutical Journal*, 298.
- ANDERSON, C. 2000. Health promotion in community pharmacy: the UK situation. *Patient education and counseling*, 39, 285-291.
- ANDERSON, S. 2007. Community pharmacy and public health in Great Britain, 1936 to 2006: how a phoenix rose from the ashes. *Journal of Epidemiology and Community Health*, 61, 844-848.
- ANDERSON, S. 2015. The Historical Context of Pharmacy and Pharmacy Practice. In: HARDING, G. & TAYLOR, K. M. (eds.) *Pharmacy practice*. CRC Press.
- ANON. 2017. *Patient Safety - Quality Improvement: Anatomy of an Error* [Online]. Duke University School of Medicine. Available: http://patientsafetyed.duhs.duke.edu/module_e/swiss_cheese.html [Accessed 31 October 2017].
- ANTO, B., JAMES, K. L., BARLOW, D., BRINKLOW, N., OBORNE, C. A. & WHITTLESEA, C. 2013. Exploratory study to identify the process used by pharmacy staff to verify the accuracy of dispensed medicines. *International Journal of Pharmacy Practice*, 21, 233-242.
- APPELBE, G. E. & WINGFIELD, J. 2013. *Dale and Appelbe's Pharmacy and Medicines Law*, Pharmaceutical Press.
- ASHCROFT, D., MORECROFT, C., PARKER, D. & NOYCE, P. 2006. Likelihood of reporting adverse events in community pharmacy: an experimental study. *Quality and Safety in Health Care*, 15, 48-52.
- ASHCROFT, D. M., QUINLAN, P. & BLENKINSOPP, A. 2005. Prospective study of the incidence, nature and causes of dispensing errors in community pharmacies. *Pharmacoepidemiology and Drug Safety*, 14, 327-332.

- BARBOUR, R. S. 2001. Checklists for improving rigour in qualitative research: a case of the tail wagging the dog? *BMJ : British Medical Journal*, 322, 1115-1117.
- BERNARD, H. R. & BERNARD, H. R. 2012. *Social Research Methods: Qualitative and Quantitative Approaches*, SAGE Publications.
- BESO, A., FRANKLIN, B. D. & BARBER, N. 2005. The Frequency and Potential Causes of Dispensing Errors in a Hospital Pharmacy. *Pharmacy World and Science*, 27, 182-190.
- BLENKINSOPP, A., BOND, C., CELINO, G., INCH, J. & GRAY, N. 2009. *National Evaluation of the new pharmacy contract*, London, Pharmacy Practice Research Trust.
- BOND, C., BLENKINSOPP, A., INCH, J., CELINO, G. & GRAY, N. 2008. *The effect of the new community pharmacy contract on the community pharmacy workforce*, London, The Pharmacy Practice Research Group.
- BOND, C. A. & RAEHL, C. L. 2001. Pharmacists' Assessment of Dispensing Errors: Risk Factors, Practice Sites, Professional Functions, and Satisfaction. *Pharmacotherapy: The Journal of Human Pharmacology and Drug Therapy*, 21, 614-626.
- BORLAND, K. W. 2001. Qualitative and Quantitative Research: A Complementary Balance. *New Directions for Institutional Research*, 2001, 5-13.
- BRAUN, V. & CLARKE, V. 2006. Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3, 77-101.
- BUCHANAN, T. L., BARKER, K. N., GIBSON, J. T., JIANG, B. C. & PEARSON, R. E. 1991. Illumination and errors in dispensing. *Am J Hosp Pharm*, 48, 2137-45.
- BULLOCK, A., ALLAN, M., BARNES, E., HODSON, K. & RUSS, E. 2016. *Enhancing skill-mix in community pharmacies*, Cardiff, Pharmacy Research UK.
- BUSH, J., LANGLEY, C. A. & WILSON, K. A. 2009. The corporatization of community pharmacy: implications for service provision, the public health function, and pharmacy's claims to professional status in the United Kingdom. *Research in social and administrative pharmacy*, 5, 305-318.
- CALLEGARO, M., MANFREDI, K. L. & VEHOVAR, V. 2015. *Web Survey Methodology*, SAGE Publications.

- CARAYON, P. 2016. *Handbook of Human Factors and Ergonomics in Health Care and Patient Safety, Second Edition*, CRC Press.
- CARAYON, P., XIE, A. & KIANFAR, S. 2014. Human factors and ergonomics as a patient safety practice. *BMJ Qual Saf*, 23, 196-205.
- CHEUNG, K.-C., BOUVY, M. L. & DE SMET, P. A. G. M. 2009. Medication errors: the importance of safe dispensing. *British Journal of Clinical Pharmacology*, 67, 676-680.
- CHUA, S.-S., WONG, I. C. K., EDMONDSON, H., ALLEN, C., CHOW, J., PEACHAM, J., HILL, G. & GRANTHAM, J. 2003. A Feasibility Study for Recording of Dispensing Errors and 'Near Misses' in Four UK Primary Care Pharmacies. *Drug Safety*, 26, 803-813.
- CHUI, M. A., LOOK, K. A. & MOTT, D. A. 2014. The association of subjective workload dimensions on quality of care and pharmacist quality of work life. *Research in Social and Administrative Pharmacy*, 10, 328-340.
- CHUI, M. A. & MOTT, D. A. 2012. Community Pharmacists' Subjective Workload and Perceived Task Performance: a Human Factors Approach. *Journal of the American Pharmacists Association : JAPhA*, 52, e153-e160.
- COHEN, M. R. 2007. *Medication errors*, American Pharmacist Associa.
- COX, T. 2016. *Lawyer: Martin White's sentencing is 'shocking and wrong'* [Online]. Chemist and Druggist. Available: <https://www.chemistanddruggist.co.uk/news/lawyer-pharmacists-sentencing-shocking-and-wrong> [Accessed 4th September 2017].
- CRABTREE, V., HALL, J., ZARGARANI, M., SMITH, I., MALDE, H., PATEL, R. & WOODHOUSE, E. 2010. The impact of accredited checking technicians on community pharmacy services: the views of pharmacists. *13th Health Service Research and Pharmacy Practice Conference*. Keele University: International Journal of Pharmacy Practice.
- CRESWELL, J. W. 2013. *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*, SAGE Publications.
- DARKER, I. T., GERRET, D., FILIK, R., PURDY, K. J. & GALE, A. G. 2011. The influence of 'Tall Man' lettering on errors of visual perception in the recognition of written drug names. *Ergonomics*, 54, 21-33.

- DAVIES, J. E., BARBER, N. & TAYLOR, D. 2014. What do community pharmacists do?: results from a work sampling study in London. *International Journal of Pharmacy Practice*, 22, 309-318.
- DEAN, B., SCHACHTER, M., VINCENT, C. & BARBER, N. 2002. Causes of prescribing errors in hospital inpatients: a prospective study. *The Lancet*, 359, 1373-1378.
- DEHENAU, C., BECKER, M. W., BELLO, N. M., LIU, S. & BIX, L. 2016. Tallman lettering as a strategy for differentiation in look-alike, sound-alike drug names: the role of familiarity in differentiating drug doppelgangers. *Applied ergonomics*, 52, 77-84.
- DEKKER, S. W. 2009. Prosecuting professional mistake: Secondary victimization and a research agenda for criminology. *International Journal of Criminal Justice Sciences*, 4.
- DELGADO-RODRÍGUEZ, M. & LLORCA, J. 2004. Bias. *Journal of Epidemiology and Community Health*, 58, 635-641.
- DENSCOMBE, M. 2008. Communities of Practice. *Journal of Mixed Methods Research*, 2, 270-283.
- DEPARTMENT OF HEALTH 2000. *An organisation with a memory: Report of an expert group on learning from adverse events in the NHS* London, The Stationery Office.
- DEPARTMENT OF HEALTH 2003. *A Vision for Pharmacy in the New NHS*, London, Department of Health Publications.
- DICICCO-BLOOM, B. & CRABTREE, B. F. 2006. The qualitative research interview. *Medical Education*, 40, 314-321.
- DREWS, F. A. 2016. Human Error in Health Care. In: CARAYON, P. (ed.) *Handbook of Human Factors and Ergonomics in Health Care and Patient Safety, Second Edition*. New York: CRC Press.
- DUFFY, V. G. 2010. *Advances in Human Factors and Ergonomics in Healthcare*, CRC Press.
- DURES, E., RUMSEY, N., MORRIS, M. & GLEESON, K. 2011. Mixed methods in health psychology: Theoretical and practical considerations of the third paradigm. *Journal of health psychology*, 16, 332-341.

- EDEN, M., SCHAFHEUTLE, E. I. & HASSELL, K. 2009. Workload pressure among recently qualified pharmacists: an exploratory study of intentions to leave the profession. *International Journal of Pharmacy Practice*, 17, 181-187.
- ELO, S. & KYNGÄS, H. 2008. The qualitative content analysis process. *Journal of Advanced Nursing*, 62, 107-115.
- EMMERTON, L. M. & RIZK, M. F. 2012. Look-alike and sound-alike medicines: risks and 'solutions'. *International journal of clinical pharmacy*, 34, 4-8.
- ETIKAN, I., MUSA, S. A. & ALKASSIM, R. S. 2016. Comparison of convenience sampling and purposive sampling. *American Journal of Theoretical and Applied Statistics*, 5, 1-4.
- EVANS, K. D., BENHAM, S. W. & GARRARD, C. S. 1998. A comparison of handwritten and computer-assisted prescriptions in an intensive care unit. *Critical Care*, 2, 73.
- FEYER, A. M. & WILLIAMSON, A. M. 1998. Human Factors in Accident Modelling. In: STELLMAN, J. M. (ed.) *Encyclopaedia of occupational health and safety*. International Labour Organization.
- FILIK, R., PURDY, K., GALE, A. & GERRETT, D. 2004. Drug name confusion: evaluating the effectiveness of capital ("Tall Man") letters using eye movement data. *Social science & medicine*, 59, 2597-2601.
- FILIK, R., PURDY, K., GALE, A. & GERRETT, D. 2006. Labeling of medicines and patient safety: evaluating methods of reducing drug name confusion. *Human Factors*, 48, 39-47.
- FLIN, R., BROMILEY, M., BUCKLE, P. & REID, J. 2013. Changing behaviour with a human factors approach. *Bmj*, 346, f1416.
- FLYNN, E. A., BARKER, K. N., GIBSON, J. T., PEARSON, R. E., BERGER, B. A. & SMITH, L. A. 1999. Impact of interruptions and distractions on dispensing errors in an ambulatory care pharmacy. *American Journal of Health-System Pharmacy*, 56, 1319-1325.
- FLYNN, E. A., DORRIS, N. T., HOLMAN, G. T., CAMAHAN, B. J. & BARKER, K. N. 2002. Medication Dispensing Errors in Community Pharmacies: A Nationwide Study. *Proceedings of the Human Factors and Ergonomics Society Annual Meeting*, 46, 1448-1451.

- FRANKLIN, B. D. & O'GRADY, K. 2007. Dispensing errors in community pharmacy: frequency, clinical significance and potential impact of authentication at the point of dispensing. *International Journal of Pharmacy Practice*, 15, 273-281.
- GALE, N. K., HEATH, G., CAMERON, E., RASHID, S. & REDWOOD, S. 2013. Using the framework method for the analysis of qualitative data in multi-disciplinary health research. *BMC medical research methodology*, 13, 117.
- GEARING, R. E., MIAN, I. A., BARBER, J. & ICKOWICZ, A. 2006. A methodology for conducting retrospective chart review research in child and adolescent psychiatry. *Journal of the Canadian Academy of Child and Adolescent Psychiatry*, 15, 126.
- GENERAL PHARMACEUTICAL COUNCIL 2010. Standards of conduct, ethics and performance. London: General Pharmaceutical Council.
- GENERAL PHARMACEUTICAL COUNCIL. 2015.
- GIDMAN, W. 2011. Increasing community pharmacy workloads in England: causes and consequences. *International journal of clinical pharmacy*, 33, 512.
- GIDMAN, W. K., HASSELL, K., DAY, J. & PAYNE, K. 2007. The impact of increasing workloads and role expansion on female community pharmacists in the United Kingdom. *Research in Social and Administrative Pharmacy*, 3, 285-302.
- GILLESPIE, A. & WEARE, S. 2017. *The English Legal System*, Oxford University Press.
- GOSNEY, M. 2010. *The Legacy of Elizabeth Lee* [Online]. Chemist + Druggist. Available: <https://www.chemistanddruggist.co.uk/news/legacy-elizabeth-lee> [Accessed 4th August 2017].
- GRASHA, A. F. 2001. Misconceptions about Pharmacy Workload-A study of the link between workload and pharmacy prescribing errors yields some surprising results. *Canadian Pharmaceutical Journal*, 134, 26-35.
- GRASHA, A. F. & SCHELL, K. 2001. Psychosocial factors, workload, and human error in a simulated pharmacy dispensing task. *Perceptual and motor skills*, 92, 53-71.
- GREENE, J. C. 2008. Is mixed methods social inquiry a distinctive methodology? *Journal of mixed methods research*, 2, 7-22.

- GREENE, J. C., CARACELLI, V. J. & GRAHAM, W. F. 1989. Toward a Conceptual Framework for Mixed-Method Evaluation Designs. *Educational Evaluation and Policy Analysis*, 11, 255-274.
- GRUNDGEIGER, T. & SANDERSON, P. 2009. Interruptions in healthcare: Theoretical views. *International Journal of Medical Informatics*, 78, 293-307.
- GUBA, E. G. & LINCOLN, Y. S. 1994. Competing paradigms in qualitative research. *Handbook of qualitative research*, 2, 105.
- HADI, M. A., ALLDRED, D. P., CLOSS, S. J. & BRIGGS, M. 2014. Mixed-methods research in pharmacy practice: recommendations for quality reporting (part 2). *International Journal of Pharmacy Practice*, 22, 96-100.
- HAMMERSLEY, M. 2003. *Dilemma Qualitative Method*, Routledge.
- HARDING, G. & TAYLOR, K. M. G. 2015. *Pharmacy Practice, Second Edition*, CRC Press.
- HASSELL, K. 2011. CPWS Briefing Paper: GPhC Register Analysis 2011.
- HASSELL, K., SESTON, E. M., SCHAFHEUTLE, E. I., WAGNER, A. & EDEN, M. 2011. Workload in community pharmacies in the UK and its impact on patient safety and pharmacists' well-being: a review of the evidence. *Health & Social Care in the Community*, 19, 561-575.
- HATTINGH, H. L., KING, M. A. & SMITH, N. A. 2009. An evaluation of the integration of standards and guidelines in community pharmacy practices. *Pharmacy world & science*, 31, 542-549.
- HEALTH AND SOCIAL CARE INFORMATION CENTRE 2013. General Pharmaceutical Services in England: 2003-04 to 2012-13. *In*: CENTRE, H. A. S. C. I. (ed.).
- HEALTH AND SOCIAL CARE INFORMATION CENTRE 2016a. *General Pharmaceutical Services: England 2006/07 to 2015/16*, Health and Social Care Information Centre.
- HEALTH AND SOCIAL CARE INFORMATION CENTRE 2016b. *Prescriptions Dispensed in the Community: England 2005-2015*, The Health and Care Information Centre.

- HEALTH AND SOCIAL CARE INFORMATION CENTRE 2017. *General Pharmaceutical Services: England 2007/08 to 2016/17*, Health and Social Care Information Centre.
- HELLIER, E., EDWORTHY, J., DERBYSHIRE, N. & COSTELLO, A. 2006. Considering the impact of medicine label design characteristics on patient safety. *Ergonomics*, 49, 617-630.
- HESS, D. R. 2004. Retrospective studies and chart reviews. *Respiratory care*, 49, 1171-1174.
- HIGNETT, S., CARAYON, P., BUCKLE, P. & CATCHPOLE, K. 2013. State of science: human factors and ergonomics in healthcare. *Ergonomics*, 56, 1491-1503.
- HOLDEN, R. J., PATEL, N. R., SCANLON, M. C., SHALABY, T. M., ARNOLD, J. M. & KARSH, B.-T. 2010. Effects of mental demands during dispensing on perceived medication safety and employee well-being: A study of workload in pediatric hospital pharmacies. *Research in Social and Administrative Pharmacy*, 6, 293-306.
- HOUSE OF COMMONS. 2009. *Decriminalisation of Pharmaceutical Errors* [Online]. Available: <https://publications.parliament.uk/pa/cm200809/cmpublic/health/090625/pm/90625s09.htm> [Accessed 4th August 2017].
- HOWE, K. R. 1988. Against the quantitative-qualitative incompatibility thesis or dogmas die hard. *Educational researcher*, 17, 10-16.
- HUGHES, C. M. & MCCANN, S. 2003. Perceived interprofessional barriers between community pharmacists and general practitioners: a qualitative assessment. *Br J Gen Pract*, 53, 600-606.
- IRWIN, A., MEARNS, K., WATSON, M. & URQUHART, J. 2013. The effect of proximity, Tall Man lettering, and time pressure on accurate visual perception of drug names. *Human factors*, 55, 253-266.
- JACOBS, S., ASHCROFT, D. & HASSELL, K. 2011. Culture in community pharmacy organisations: what can we glean from the literature? *Journal of health organization and management*, 25, 420-454.
- JACOBS, S., HASSELL, K., ASHCROFT, D., JOHNSON, S. & O'CONNOR, E. 2014. Workplace stress in community pharmacies in England: associations with individual, organizational and job characteristics. *Journal of Health Services Research & Policy*, 19, 27-33.

- JAMES, K. L., BARLOW, D., BITHELL, A., BURFIELD, R., HIOM, S., LORD, S., POLLARD, M., ROBERTS, D., WAY, C. & SUTTON, C. 2011a. Measuring dispensary workload: a comparison of the event recording and direct time techniques. *International Journal of Pharmacy Practice*, 19, 264-275.
- JAMES, K. L., BARLOW, D., BURFIELD, R., HIOM, S., ROBERTS, D. & WHITTLESEA, C. 2011b. Unprevented or prevented dispensing incidents: which outcome to use in dispensing error research? *International Journal of Pharmacy Practice*, 19, 36-50.
- JAMES, K. L., BARLOW, D., HIOM, S., ROBERTS, D. & WHITTLESEA, C. 2008. Development and use of the critical incident technique in evaluating causes of dispensing incidents. *International Journal of Pharmacy Practice*, 16, 239-249.
- JAMES, K. L., BARLOW, D., MCARTNEY, R., HIOM, S., ROBERTS, D. & WHITTLESEA, C. 2009. Incidence, type and causes of dispensing errors: A review of the literature. *International Journal of Pharmacy Practice*, 17, 9-30.
- JOHNSON, R. B. & ONWUEGBUZIE, A. J. 2004. Mixed methods research: A research paradigm whose time has come. *Educational researcher*, 33, 14-26.
- JOHNSON, R. B., ONWUEGBUZIE, A. J. & TURNER, L. A. 2007. Toward a definition of mixed methods research. *Journal of mixed methods research*, 1, 112-133.
- JOHNSON, S., O'CONNOR, E., JACOBS, S., HASSELL, K. & ASHCROFT, D. 2014. The relationships among work stress, strain and self-reported errors in UK community pharmacy. *Research in Social and Administrative Pharmacy*, 10, 885-895.
- JONES, J. 2000. The healthcare professional and the Bolam test. *British dental journal*, 188, 237.
- JUPP, V. 2006. *The SAGE Dictionary of Social Research Methods*, SAGE Publications.
- KIEKKAS, P., ARETHA, D., KARGA, M. & KARANIKOLAS, M. 2009. Self report may lead to underestimation of 'wrong dose' medication errors. *British journal of clinical pharmacology*, 68, 963-964.
- KING, N. 2004. Using Interviews in Qualitative Research. In: CASSELL, C. & SYMON, G. (eds.) *Essential Guide to Qualitative Methods in Organizational Research*. SAGE Publications.

- KIRK, S., PARKER, D., CLARIDGE, T., ESMAIL, A. & MARSHALL, M. 2007. Patient safety culture in primary care: developing a theoretical framework for practical use. *Quality and Safety in Health Care*, 16, 313-320.
- KNUDSEN, P., HERBORG, H., MORTENSEN, A., KNUDSEN, M. & HELLEBEK, A. 2007a. Preventing medication errors in community pharmacy: frequency and seriousness of medication errors. *Quality and safety in Health care*, 16, 291-296.
- KNUDSEN, P., HERBORG, H., MORTENSEN, A., KNUDSEN, M. & HELLEBEK, A. 2007b. Preventing medication errors in community pharmacy: root-cause analysis of transcription errors. *Quality and Safety in Health Care*, 16, 285-290.
- KRAUSS, S. E. 2005. Research paradigms and meaning making: A primer. *The qualitative report*, 10, 758-770.
- KREMERS, E. & SONNEDECKER, G. 1986. *Kremers and Urdang's history of pharmacy*, Amer. Inst. History of Pharmacy.
- KRIPPENDORFF, K. 2004. *Content analysis: An introduction to its methodology*, Sage.
- KUHN, T. S. & HACKING, I. 2012. *The Structure of Scientific Revolutions: 50th Anniversary Edition*, University of Chicago Press.
- LAMBERT, B. L., LIN, S.-J. & TAN, H. 2005. Designing safe drug names. *Drug Safety*, 28, 495-512.
- LANGLEY, C. A. 2013. Pharmacy legislation: public protector or professional hindrance? *Medical law review*, 22, 87-108.
- LEA, V. M., CORLETT, S. A. & RODGERS, R. M. 2012. Workload and its impact on community pharmacists' job satisfaction and stress: a review of the literature. *International Journal of Pharmacy Practice*, 20, 259-271.
- LEA, V. M., CORLETT, S. A. & RODGERS, R. M. 2015. Describing interruptions, multi-tasking and task-switching in community pharmacy: a qualitative study in England. *International Journal of Clinical Pharmacy*, 37, 1086-1094.
- LEA, V. M., CORLETT, S. A. & RODGERS, R. M. 2016. Delegation: a solution to the workload problem? Observations and interviews with community pharmacists in England. *International Journal of Pharmacy Practice*, 24, 170-179.

- LEAPE, L. L. 1997. A systems analysis approach to medical error. *Journal of evaluation in clinical practice*, 3, 213-222.
- LEAPE, L. L. 2006. Systems analysis and redesign: The foundation of medical error prevention. In: COHEN, M. R. (ed.) *Medication errors*. Washington: American Pharmacist's Association.
- LINCOLN, Y. S., LYNHAM, S. A. & GUBA, E. G. 2011. Paradigmatic controversies, contradictions, and emerging confluences, revisited. *The Sage handbook of qualitative research*, 4, 97-128.
- LOUISE BARRIBALL, K. & WHILE, A. 1994. Collecting Data using a semi-structured interview: a discussion paper. *Journal of advanced nursing*, 19, 328-335.
- LYNSKEY, D., HAIGH, S. J., PATEL, N. & MACADAM, A. B. 2007. Medication errors in community pharmacy: an investigation into the types and potential causes. *International Journal of Pharmacy Practice*, 15, 105-112.
- MALONE, D. C., ABARCA, J., SKREPNEK, G. H., MURPHY, J. E., ARMSTRONG, E. P., GRIZZLE, A. J., REHFELD, R. A. & WOOSLEY, R. L. 2007. Pharmacist workload and pharmacy characteristics associated with the dispensing of potentially clinically important drug-drug interactions. *Medical care*, 45, 456-462.
- MANGINO, P. D. 2004. Role of the pharmacist in reducing medication errors. *Journal of surgical oncology*, 88, 189-194.
- MANN, C. 2003. Observational research methods. Research design II: cohort, cross sectional, and case-control studies. *Emergency medicine journal*, 20, 54-60.
- MCCANN, L., ADAIR, C. G. & HUGHES, C. M. 2009a. An exploration of work-related stress in Northern Ireland community pharmacy: a qualitative study. *International Journal of Pharmacy Practice*, 17, 261-267.
- MCCANN, L., HUGHES, C. M. & ADAIR, C. G. 2010. A self-reported work-sampling study in community pharmacy practice: a 2009 update. *Pharmacy world & science*, 32, 536-543.
- MCCANN, L., HUGHES, C. M., ADAIR, C. G. & CARDWELL, C. 2009b. Assessing job satisfaction and stress among pharmacists in Northern Ireland. *Pharmacy world & science*, 31, 188.
- MERRILLS, J. & FISHER, J. 2013. *Pharmacy Law and Practice*, Elsevier Science.

- MILES, M. B. & HUBERMAN, A. M. 1984. Drawing valid meaning from qualitative data: Toward a shared craft. *Educational researcher*, 13, 20-30.
- MORGAN, D. L. 2007. Paradigms lost and pragmatism regained: Methodological implications of combining qualitative and quantitative methods. *Journal of mixed methods research*, 1, 48-76.
- MOSSIALOS, E., COURTIN, E., NACI, H., BENRIMOJ, S., BOUVY, M., FARRIS, K., NOYCE, P. & SKETRIS, I. 2015. From “retailers” to health care providers: Transforming the role of community pharmacists in chronic disease management. *Health Policy*, 119, 628-639.
- MOSSIALOS, E., NACI, H. & COURTIN, E. 2013. Expanding the role of community pharmacists: policymaking in the absence of policy-relevant evidence? *Health Policy*, 111, 135-148.
- MULLEN, R. 2004. Skill mix in community pharmacy: exploring and defining the roles of dispensary support staff. London: Royal Pharmaceutical Society of Great Britain.
- NATIONAL PATIENT SAFETY AGENCY 2004. *Seven steps to patient safety. The full reference guide.*, London, NPSA.
- NATIONAL PATIENT SAFETY AGENCY 2007. *Design for patient safety: A guide to the design of the dispensing environment*, London, NPSA.
- NATIONAL PATIENT SAFETY AGENCY 2009. *Safety in Doses: Improving the use of medicines in the NHS*. London: National Patient Safety Agency.
- NATIONAL PATIENT SAFETY AGENCY. 2011. *NPSA releases Organisation Patient Safety Incident reporting data (England)* [Online]. National Patient Safety Agency. Available: <http://www.npsa.nhs.uk/corporate/news/npsa-releases-organisation-patient-safety-incident-reporting-data-england/> [Accessed 11th September 2017].
- NATIONAL PATIENT SAFETY AGENCY. 2017. Available: <http://www.npsa.nhs.uk/> [Accessed 31 October 2017].
- NIEVA, V. & SORRA, J. 2003. Safety culture assessment: a tool for improving patient safety in healthcare organizations. *Quality and Safety in Health Care*, 12, ii17-ii23.
- NORDÉN-HÄGG, A., KÄLVEMARK-SPORRONG, S. & LINDBLAD, Å. K. 2012. Exploring the relationship between safety culture and reported dispensing

- errors in a large sample of Swedish community pharmacies. *BMC Pharmacology and Toxicology*, 13, 4.
- NORDÉN-HÄGG, A., SEXTON, J. B., KÄLVEMARK-SPORRONG, S., RING, L. & KETTIS-LINDBLAD, Å. 2010. Assessing safety culture in pharmacies: the psychometric validation of the Safety Attitudes Questionnaire (SAQ) in a national sample of community pharmacies in Sweden. *BMC clinical pharmacology*, 10, 8.
- NOYCE, P. R. 2007. Providing patient care through community pharmacies in the UK: policy, practice, and research. *Annals of Pharmacotherapy*, 41, 861-868.
- O'CATHAIN, A., MURPHY, E. & NICHOLL, J. 2007. Why, and how, mixed methods research is undertaken in health services research in England: a mixed methods study. *BMC health services research*, 7, 85.
- OPDENAKKER, R. 2006. Advantages and Disadvantages of Four Interview Techniques in Qualitative Research. 2006, 7.
- OR, C. K. & WANG, H. H. Examining Text Enhancement Methods to Improve Look-alike Drug Name Differentiation Accuracy. Proceedings of the Human Factors and Ergonomics Society Annual Meeting, 2013. SAGE Publications Sage CA: Los Angeles, CA, 645-649.
- PERVANAS, H. C., REVELL, N. & ALOTAIBI, A. F. 2016. Evaluation of Medication Errors in Community Pharmacy Settings: A Retrospective Report. *Journal of Pharmacy Technology*, 32, 71-74.
- PETERSON, G. M., WU, M. S. H. & BERGIN, J. K. 1999. Pharmacists' attitudes towards dispensing errors: their causes and prevention. *Journal of Clinical Pharmacy and Therapeutics*, 24, 57-71.
- PHARMACEUTICAL SERVICES NEGOTIATING COMMITTEE. 2017a. *Essential facts, stats and quotes relating to pharmacy and pharmacy professionals* [Online]. Available: <http://psnc.org.uk/services-commissioning/essential-facts-stats-and-quotes-relating-to-pharmacy-and-pharmacy-professionals/> [Accessed 4th August 2017].
- PHARMACEUTICAL SERVICES NEGOTIATING COMMITTEE. 2017b. *Patient safety incident reporting* [Online]. Available: <http://psnc.org.uk/contract-it/essential-service-clinical-governance/patient-safety-incident-reporting/> [Accessed 12th August 2017].
- PHARMACEUTICAL SERVICES NEGOTIATING COMMITTEE. 2018. *Dispensing errors legislation comes into force* [Online]. Available: <https://psnc.org.uk/our->

[news/dispensing-errors-legislation-comes-into-force/](#) [Accessed 8 September 2018].

- PHIPPS, D. L., DE BIE, J., HERBORG, H., GUERREIRO, M., EICKHOFF, C., FERNANDEZ-LLIMOS, F., BOUVY, M. L., ROSSING, C., MUELLER, U. & ASHCROFT, D. M. 2012. Evaluation of the Pharmacy Safety Climate Questionnaire in European community pharmacies. *International Journal for Quality in Health Care*, 24, 16-22.
- PHIPPS, D. L., NOYCE, P. R., PARKER, D. & ASHCROFT, D. M. 2009. Medication safety in community pharmacy: a qualitative study of the sociotechnical context. *BMC health services research*, 9, 158.
- PL. 2016. *The Martin White Case: Is it time to close in on a transparent culture?* [Online]. Pharmacy Life. Available: <http://pharmacy-life.co.uk/martin-white-case-time-close-transparent-culture/> [Accessed 6th September 2017].
- POPE, C., ZIEBLAND, S. & MAYS, N. 2000. Analysing qualitative data. *BMJ : British Medical Journal*, 320, 114-116.
- PUNCH, K. F. 2013. *Introduction to Social Research: Quantitative and Qualitative Approaches*, SAGE Publications.
- RAO, P. S. & RICHARD, J. 2012. *Introduction to biostatistics and research methods*, PHI Learning Pvt. Ltd.
- RASMUSSEN, J. 1983. Skills, rules, and knowledge; signals, signs, and symbols, and other distinctions in human performance models. *IEEE transactions on systems, man, and cybernetics*, 257-266.
- REASON, J. 1990. *Human error*, Cambridge university press.
- REASON, J. 2000. Human error: models and management. *BMJ: British Medical Journal*, 320, 768.
- REILLEY, S., GRASHA, A. F. & SCHAFER, J. 2002. Workload, Error Detection, and Experienced Stress in a Simulated Pharmacy Verification Task. *Perceptual and Motor Skills*, 95, 27-46.
- REMINGTON, J. P. 2006. *Remington: the science and practice of pharmacy*, Lippincott Williams & Wilkins.

- RICHARDSON, E. & POLLOCK, A. M. 2010. Community pharmacy: moving from dispensing to diagnosis and treatment. *BMJ: British Medical Journal (Online)*, 340.
- RITCHIE, J., LEWIS, J., LEWIS, P. S. P. J., NICHOLLS, C. M. N. & ORMSTON, R. 2013. *Qualitative Research Practice: A Guide for Social Science Students and Researchers*, SAGE Publications.
- ROSENBLOOM, K., TAYLOR, K. & HARDING, G. 2000. Community pharmacists' attitudes towards research. *International Journal of Pharmacy Practice*, 8, 103-110.
- ROYAL PHARMACEUTICAL SOCIETY OF GREAT BRITAIN 2015. *Medicines, Ethics and Practice 39: The professional guide for pharmacists*, Pharmaceutical Press.
- RUTTER, P., HUNT, A., DARRACOTT, R. & JONES, I. 1998. A subjective study of how community pharmacists in Great Britain spend their time. *Journal of Social and Administrative Pharmacy*, 15, 252-261.
- SAKS, M. & ALLSOP, J. 2012. *Researching Health: Qualitative, Quantitative and Mixed Methods*, SAGE Publications.
- SALE, J. E., LOHFELD, L. H. & BRAZIL, K. 2002. Revisiting the quantitative-qualitative debate: Implications for mixed-methods research. *Quality and quantity*, 36, 43-53.
- SÁNCHEZ, A. D. L. M. M. 2013. Medication errors in a Spanish community pharmacy: nature, frequency and potential causes. *International journal of clinical pharmacy*, 35, 185-189.
- SANTOMAURO, C. M., KALKMAN, C. J. & DEKKER, S. 2014. Second victims, organizational resilience and the role of hospital administration. *Journal of Hospital Administration*, 3, 95.
- SARAMUNEE, K., KRSKA, J., MACKRIDGE, A., RICHARDS, J., SUTTAJIT, S. & PHILLIPS-HOWARD, P. 2014. How to enhance public health service utilization in community pharmacy?: General public and health providers' perspectives. *Research in Social and Administrative Pharmacy*, 10, 272-284.
- SAVAGE, I. 1999. The changing face of pharmacy practice—evidence from 20 years of work sampling studies. *International Journal of Pharmacy Practice*, 7, 209-219.

- SCHAFER, J. L. 1999. Multiple imputation: a primer. *Statistical Methods in Medical Research*, 8, 3-15.
- SCHAFHEUTLE, E. I., SESTON, E. M. & HASSELL, K. 2011. Factors influencing pharmacist performance: A review of the peer-reviewed literature. *Health Policy*, 102, 178-192.
- SCHELL, K. L. 2009. Using enhanced text to facilitate recognition of drug names: evidence from two experimental studies. *Applied ergonomics*, 40, 82-90.
- SCHELL, K. L. & GRASHA, A. F. 2000. State anxiety, performance accuracy, and work pace in a simulated pharmacy dispensing task. *Perceptual and motor skills*, 90, 547-561.
- SCHELL, K. L. & REILLEY, S. P. 2004. Quality control pharmacy tasks: Big five personality model and accuracy of error detection. *Psychological reports*, 94, 1301-1311.
- SESTON, E. & HASSELL, K. 2009. *Pharmacy workforce census 2008: Main findings*, London, Royal Pharmaceutical Society of Great Britain.
- SESTON, E. & HASSELL, K. 2014. British pharmacists' work-life balance – is it a problem? *International Journal of Pharmacy Practice*, 22, 135-145.
- SHAW, R., DREVER, F., HUGHES, H., OSBORN, S. & WILLIAMS, S. 2005. Adverse events and near miss reporting in the NHS. *Quality and Safety in Health Care*, 14, 279-283.
- SHERIDAN, T. 2003. Human error. *Quality and safety in health care*, 12, 383-385.
- SHI, L. 2007. *Health Services Research Methods*, Cengage Learning.
- SINGER, S. J., GABA, D., GEPPERT, J., SINAICO, A., HOWARD, S. K. S. & PARK, K. 2003. The culture of safety: results of an organization-wide survey in 15 California hospitals. *Quality and safety in health care*, 12, 112-118.
- SLAPPER, G. & KELLY, D. 2015. *The English Legal System: 2015-2016*, Taylor & Francis.
- SLEVITCH, L. 2011. Qualitative and quantitative methodologies compared: Ontological and epistemological perspectives. *Journal of Quality Assurance in Hospitality & Tourism*, 12, 73-81.

- SMITH, J. K. & HESHUSIUS, L. 1986. Closing down the conversation: The end of the quantitative-qualitative debate among educational inquirers. *Educational researcher*, 15, 4-12.
- SOMMER HARRITS, G. 2011. More than method?: A discussion of paradigm differences within mixed methods research. *Journal of Mixed Methods Research*, 5, 150-166.
- SUKKAR, E. 2016. Community pharmacy in Great Britain 2016: a fragmented market. *The Pharmaceutical Journal*, 296.
- SZEINBACH, S., SEOANE-VAZQUEZ, E., PAREKH, A. & HERDERICK, M. 2007. Dispensing errors in community pharmacy: perceived influence of sociotechnical factors. *International Journal for Quality in Health Care*, 19, 203-209.
- TAMUZ, M., THOMAS, E. & FRANCHOIS, K. 2004. Defining and classifying medical error: lessons for patient safety reporting systems. *Quality and Safety in Health Care*, 13, 13-20.
- TASHAKKORI, A. & TEDDLIE, C. 2003. *Handbook of Mixed Methods in Social & Behavioral Research*, SAGE Publications.
- TAYLOR, K. M. & HARDING, G. 2003. *Pharmacy practice*, CRC Press.
- TAYLOR, K. M. G., NETTLETON, S. & HARDING, G. 2004. *Sociology for Pharmacists: An Introduction*, CRC Press.
- TEDDLIE, C. & TASHAKKORI, A. 2009. *Foundations of Mixed Methods Research: Integrating Quantitative and Qualitative Approaches in the Social and Behavioral Sciences*, SAGE Publications.
- TEDDLIE, C. & YU, F. 2007. Mixed methods sampling: A typology with examples. *Journal of mixed methods research*, 1, 77-100.
- TEFF, H. 1998. The Standard of Care in Medical Negligence—Moving on from Bolam? *Oxford Journal of Legal Studies*, 18, 473-484.
- TEINILÄ, T., GRÖNROOS, V. & AIRAKSINEN, M. 2008. A system approach to dispensing errors: a national study on perceptions of the Finnish community pharmacists. *Pharmacy World & Science*, 30, 823-833.
- THE PHARMACISTS' DEFENCE ASSOCIATION 2006. Working together to keep patients safe. Birmingham: The Pharmacists' Defence Association.

- THE PHARMACISTS' DEFENCE ASSOCIATION. 2010a. *Medicines' Legislation Review; PDA wants removal of Section 64 of Medicines Act* [Online]. The Pharmacists' Defence Association. Available: <https://www.the-pda.org/medicines-legislation-review-pda-wants-removal-of-section-64-of-medicines-act/> [Accessed 4th September 2017].
- THE PHARMACISTS' DEFENCE ASSOCIATION. 2010b. *Substantial progress made as a result of the Elizabeth Lee appeal* [Online]. The Pharmacists' Defence Association. Available: <https://www.the-pda.org/substantial-progress-made-as-a-result-of-the-elizabeth-lee-appeal/> [Accessed 4th September 2017].
- TODD, A., COPELAND, A., HUSBAND, A., KASIM, A. & BAMBRA, C. 2014. The positive pharmacy care law: an area-level analysis of the relationship between community pharmacy distribution, urbanity and social deprivation in England. *BMJ open*, 4, e005764.
- TOFT, B. & GOODERHAM, P. 2009. Involuntary automaticity: a potential legal defence against an allegation of clinical negligence? *Quality and Safety in Health Care*, 18, 69-73.
- TOFT, B. & MASCIE-TAYLOR, H. 2005. Involuntary automaticity: a work-system induced risk to safe health care. *Health Services Management Research*, 18, 211-216.
- WARDLE, N. 2017. *Criminalisation of dispensing errors continues to haunt pharmacy* [Online]. The Pharmaceutical Journal. Available: <http://www.pharmaceutical-journal.com/opinion/correspondence/criminalisation-of-dispensing-errors-continues-to-haunt-pharmacy/20202185.article> [Accessed 4th September 2017].
- WEBER, M. 2017. *Methodology of social sciences*, Routledge.
- WEINGER, M. B., SLAGLE, J., JAIN, S. & ORDONEZ, N. 2003. Retrospective data collection and analytical techniques for patient safety studies. *Journal of biomedical informatics*, 36, 106-119.
- WENGER, E. 2000. Communities of practice and social learning systems. *Organization*, 7, 225-246.
- WESTRUM, R. 2004. A typology of organisational cultures. *Quality and safety in health care*, 13, ii22-ii27.
- WIEGMANN, D. A. & SHAPPELL, S. A. 2001. Human error perspectives in aviation. *The International Journal of Aviation Psychology*, 11, 341-357.

- WILLIG, C. 2013. *Introducing qualitative research in psychology*, McGraw-Hill Education (UK).
- WILLIS, J. W. & JOST, M. 2007. *Foundations of qualitative research: Interpretive and critical approaches*, Sage.
- WINGFIELD, J. 2014. *Pharmacists should delegate without fear* [Online]. The Pharmaceutical Journal. Available: <http://www.pharmaceutical-journal.com/opinion/pharmacists-should-delegate-without-fear/20065543.article> [Accessed 4th August 2017].
- WONG, L. P. 2008. Data Analysis in Qualitative Research: A Brief Guide to Using Nvivo. *Malaysian Family Physician : the Official Journal of the Academy of Family Physicians of Malaysia*, 3, 14-20.
- WREATHALL, J. & NEMETH, C. 2004. Assessing risk: the role of probabilistic risk assessment (PRA) in patient safety improvement. *Quality and Safety in Health Care*, 13, 206-212.
- WRIGHT, K. B. 2005. Researching Internet-Based Populations: Advantages and Disadvantages of Online Survey Research, Online Questionnaire Authoring Software Packages, and Web Survey Services. *Journal of Computer-Mediated Communication*, 10, 00-00.

Appendix 1 Study 1 data collection form

Study 1 Data Collection Form

Nature of Error:

- | | | | |
|------------------------|--------------------------|-------------------------------|--------------------------|
| Wrong item | <input type="checkbox"/> | Out of date medicine supplied | <input type="checkbox"/> |
| Wrong strength | <input type="checkbox"/> | Incorrect patient | <input type="checkbox"/> |
| Wrong quantity | <input type="checkbox"/> | Omission | <input type="checkbox"/> |
| Labelling/dosage error | <input type="checkbox"/> | Protocol/procedure error | <input type="checkbox"/> |
| Label swap | <input type="checkbox"/> | Other | <input type="checkbox"/> |
| | | If other, please specify: | |
| | | | |

Medication involved:

- Medicine prescribed
- Medicine supplied
- Was the label according to the prescription? ☐ Yes ☐ No
- Was the incorrect medicine ingested by the patient? ☐ Yes ☐ No

Degree of Harm suffered:

- No harm ☐
- Minor harm ☐
- Moderate harm ☐
- Serious harm ☐
- Death ☐

Which one of the following errors contributed to the dispensing error?

- | | | | |
|-------------------------|--------------------------|--|--------------------------|
| Similar packaging | <input type="checkbox"/> | Work pressure/stress | <input type="checkbox"/> |
| Similar sounding drug | <input type="checkbox"/> | Interruptions/distractions | <input type="checkbox"/> |
| Less bench space | <input type="checkbox"/> | Noise | <input type="checkbox"/> |
| Disorganised dispensary | <input type="checkbox"/> | Inadequate lighting | <input type="checkbox"/> |
| Dispensary layout | <input type="checkbox"/> | Insufficient staff at the time of the incident | <input type="checkbox"/> |

Type of Pharmacy:

- | | | | |
|----------------------------|--------------------------|------------------------|--------------------------|
| Local community (suburban) | <input type="checkbox"/> | Supermarket | <input type="checkbox"/> |
| Local community (rural) | <input type="checkbox"/> | Health centre pharmacy | <input type="checkbox"/> |
| High street | <input type="checkbox"/> | Pharmacy on GP premise | <input type="checkbox"/> |

Time of day of the dispensing error:

Early morning	<input type="checkbox"/>	Afternoon	<input type="checkbox"/>
Morning	<input type="checkbox"/>	Late afternoon	<input type="checkbox"/>
Late morning	<input type="checkbox"/>	Evening	<input type="checkbox"/>

What is the volume of prescriptions dispensed per month?

How many prescriptions were dispensed on the day of the dispensing error?

.....

How are the goods laid out in the dispensary?

All goods laid out in alphabetical order by their generic name	<input type="checkbox"/>
Generics and proprietary goods separate and in alphabetical order	<input type="checkbox"/>
All generics and proprietary goods together and in alphabetical order	<input type="checkbox"/>
Robot	<input type="checkbox"/>
Laid out some other way	<input type="checkbox"/>

Was the pharmacist familiar with the computer dispensing system?

☐ Yes ☐ No

How many members of staff (excluding the pharmacist) were present in the dispensary at the time of the incident?

What was the employment status of the pharmacist?

☐ Locum ☐ Employee

How many hours did the pharmacist work during the seven days before the incident?

.....

How many hours did the pharmacist work on the day of the dispensing incident?

.....

What was the total time taken for rest breaks (including lunch)?

.....

Did the pharmacist perform a final check on the dispensed medicine?

☐ Yes

☐ No

Appendix 2 Interview schedule for qualitative study

Interview Schedule

Start questions:

1. Describe to me what your working day involves.
2. What do you feel are the most challenging aspects of your working day?
3. How do you usually manage the dispensing of medicines and provision of clinical services?
4. What are your feelings about the potential of making a dispensing error in your daily work?

The dispensing error

5. On (date), you dispensed a prescription for (details of prescription). How well can you remember dispensing this prescription?
6. Talk me through the events that took place which led to the build-up of the dispensing error.
(Prompts: Was there anything particularly different about you or your working environment, which may have contributed to the error occurring?)
7. How familiar were you with dispensing this item?
(Prompts: Had you dispensed this item before? How frequently? How did you feel about dispensing this item? Were there any issues related to the prescription item that you feel could have contributed to the error or affecting your performance?)
8. Describe your work activities during the week (7 days) prior to the day the dispensing error took place.
(Prompts: Number of hours worked, the types of pharmacies worked in)
9. How long was it before you became aware that an error had taken place? How did you find out you made the error?
10. How did you feel when you found out you had made an error? What was your immediate response?
(Prompts: To what degree did the occurrence of the dispensing error affect your work and your personal life?)
11. Did the patient suffer any harm as a result of the dispensing error?
(Prompts: Medication taken? Degree of harm suffered? What was the patient's attitude towards you after the error? What was your attitude towards the patient?)
12. How was the dispensing error investigated and by whom? How did the investigation of the dispensing error affect you and your work?

13. What do you think were the most significant factors that contributed to the dispensing error? Was there anything that you could have done differently to prevent the error?
14. Specifically related to the dispensing error you made, how did the occurrence of the dispensing error impact your dispensing practice?

General questions

15. What (if anything) do you think would make it easier for you to prevent a dispensing error occurring?
(Prompts: Time, workload, space, design of dispensary environment, staff, interruptions and distractions, perception of patient's expectations, company policy, confidence in abilities, appropriate training)
16. From your perspective, what do you feel are the potential risk factors in community pharmacy which can result in dispensing errors?
17. Is there anything I haven't asked about that you feel is important?

Background questions

Age:

Gender:

How long have you been qualified as a pharmacist?

What is your employment status? Employed/locum

What type of pharmacy do you work in? Independent, multiple, supermarket

What type of pharmacy did you work in on the day of the dispensing error?
Independent, multiple, supermarket

The number of hours you usually work? The number of hours worked on the day of the error?

Appendix 3 Email invitation for the qualitative study

Dear community pharmacist,

I am writing to you to seek your support in a piece of research that the PDA is sponsoring.

Sadia Kousar, a research student from the School of Life and Health Sciences, Aston University, Birmingham is conducting a research study to gain a wider understanding of dispensing errors within community pharmacy.

As a member of the PDA working in community pharmacy, I believe that you are in an ideal position to provide her with valuable insights.

The interviews will focus on the experiences of community pharmacists and the potential of making a dispensing error, as well the impact that dispensing errors can have on the pharmacist's practice. The interview will last around 45-60 minutes and is largely informal in nature. The interviewer will not be making any judgement about any errors mentioned or the pharmacist's competence. Anything said will be kept confidential and nothing that could identify you will be revealed at any point.

I would be very grateful if you could consider taking part in this research. You will find attached to this email a Participant Information Leaflet that provides further details of the interviews and the wider project.

If you are willing to participate or, if you have any questions about the research, please contact Sadia directly via email at [REDACTED]. to make arrangements for the interview.

Her research is being supervised by Dr Joseph Bush who can be contacted if necessary via email at [REDACTED].

I would be grateful if you could support Sadia in what would be a very important piece of work on a subject that is very relevant to both the PDA's and our members' interests.

Thank you.

Kind Regards,

Sadia Kousar (Research student)
School of Life and Health Sciences
Aston Triangle
Birmingham
West Midlands
B4 7ET

Appendix 4 Participant Information Sheet for qualitative study

Participant Information Sheet

Project Title: A qualitative study exploring the experiences of community pharmacists who have been subject to an investigation following a dispensing error and its impact on the pharmacist's practice

You are being invited to take part in a research study. Before you decide whether or not to take part, it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully.

What is the purpose of the study?

The safe and effective supply of medicines is one of the core functions of the community pharmacist. The community pharmacy contractual changes of 2005 attempted to redirect the activity of pharmacists away from this 'supply function' and towards involvement in harm-reduction and health-improvement services. However, supply remains the primary function of the vast majority of community pharmacists. Previous research has suggested that dispensing errors by community pharmacists are very rare (4 errors per 10,000 items dispensed (Ashcroft, Quinlan and Blenkinsopp, 2005) but the introduction of the new contract has been associated with a large increase in workload accompanied with stress, work pressures and decreased job satisfaction (Bond et al, 2008; Hassell, 2011; Gidman, 2011). These findings raise questions about how pharmacists are coping with carrying out both dispensing and clinical functions safely and effectively. This research will explore the experiences and perceptions of community pharmacists who have been subject to an investigation (clinical negligence claim) following a dispensing error and how this error has impacted the pharmacist's dispensing practice.

Why have I been chosen?

Community pharmacists who have been subject to an investigation (clinical negligence claim) following a dispensing error were identified from the database of an indemnity insurance provider and have been invited to take part in this study.

What will happen to me if I take part?

If you decide to take part in the study, the researcher will arrange to meet with you at a convenient time and place. You will be asked to take part in an interview which it is estimated will last between 45 minutes and one hour.

During the interview, the researcher will ask you some questions about your experience, thoughts and opinions about dispensing errors in community pharmacy. The interview will be recorded using a digital recording device so that the interviewer can transcribe it at a later date. Anything you say will be kept completely confidential and you will not be identified in any publication resulting from this research.

Are there any potential risks in talking part in the study?

It is not expected that you will experience any adverse effects as a result of participating in the study. Anything that you chose to say will remain confidential. Nobody, including your employer, will be able to identify you or your place of work from the study results.

Do I have to take part?

No, you have no obligation to take part in this study. If you do decide to take part in the study you can still stop and withdraw at any point without having to provide an explanation.

Will my taking part in this study be kept confidential?

All of the information that you tell the researcher during the course of the research will be kept strictly confidential. Only the researcher will know who you are. The interview will be recorded on a password protected digital audio device which will be stored in a locked filing cabinet at Aston University. The recording will be downloaded onto a password protected computer at Aston University. The interview recording and transcript will be stored for up to 5 years after which it will be destroyed. You will not be able to be identified in any reports or publications.

What will happen to the results of the research study?

The interviews will be analysed and the results will be published as part of a PhD thesis and potentially in an academic journal. The researcher's academic supervisors may look at an anonymised version of the interview transcript. Direct quotations of what you have said in the interview may be used as part of the results. Nobody will be able to identify you from the quotations or results of the study.

You will be given the opportunity to give the researcher your contact details if you would like to be sent a copy of the study findings.

Who is organising and funding the research?

Sadia Kousar, a PhD student from the School of Life and Health Sciences at Aston University is organising and conducting the research. The research is supervised by Dr Joe Bush from the School of Life and Health Sciences at Aston University. The research is funded by an internal scholarship provided by the School of Life and Health Sciences at Aston University.

Who has reviewed the study?

The study has been reviewed and approved by the Ethics Committee of the School of Life and Health Sciences at Aston University.

Who do I contact if something goes wrong or I need further information?

If you have any questions, concerns or would like further information about the study please feel free to contact the researcher, Sadia Kousar, at [REDACTED] or on [REDACTED]

You can also contact the researcher's supervisor, Dr Joe Bush at [REDACTED] or on [REDACTED]

Who do I contact if I wish to make a complaint about the way in which the research is conducted?

If you have any concerns about the way in which the study has been conducted you should contact John Walter, Director of Governance, Aston University, at [REDACTED] or on [REDACTED]

Appendix 5 Volunteer consent form for qualitative study

Volunteer Consent Form

Title of Project: A qualitative study exploring the perceptions and experiences of community pharmacists following a dispensing error and its impact on the pharmacist's practice

Name of Chief Researcher: Sadia Kousar

I confirm that I have read and understood the information sheet for the above study. I have had the opportunity to consider the information and ask and questions. I confirm that the researcher has answered all the questions I had to my satisfaction.

☐

I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason, without my legal rights being affected.

☐

I agree to the interview being digitally recorded and transcribed with my personal information removed.

☐

I understand that my interview responses will be looked at by the researcher's academic supervisors. These responses will not contain any personal information that could identify me

☐

I understand that I may be directly quoted under another name. The things I say may be published but any publication will not contain any personal information that could identify me.

☐

I agree to take part in the above study.

☐

Please tick the following box if you would like to receive a copy of the study findings and provide an e-mail or postal address.

Yes

☐

NO

☐

E-mail/postal address:

Name of volunteer

Date

Signature

Researcher

Date

Signature

Appendix 6 Email invitation for survey study

Dear community pharmacist,

We are conducting an online survey as part of a research examining dispensing errors within community pharmacy. This work explores contributing factors to dispensing errors and the impact that dispensing errors can have on pharmacists' practice. We would also like to gain an insight into current working conditions in community pharmacy and if working conditions influence the occurrence of dispensing errors.

As a pharmacist working in the community setting, you are in an ideal position to provide us with valuable information and perspectives surrounding dispensing errors. The survey will take around 10-15 minutes to complete and will ask you some questions about your experience, thoughts and opinions about dispensing errors in community pharmacy as well as the working conditions of community pharmacists. All of your responses will be kept completely confidential and you will not be identified in any publication resulting from this research.

Your participation will be a valuable addition to our research and the findings could lead to greater understanding of dispensing errors within community pharmacy. You will find attached with this email a Participant Information Sheet that gives details of what you can expect throughout the online survey. The study has been given a favourable opinion by the Ethics Committee of the School of Life and Health Sciences at Aston University.

If you are willing to participate please click on the following to enter the survey:

<https://www.snapsurveys.com/wh/s.asp?k=150126293623>

If you have any questions about the survey please contact me via email at [REDACTED]. Thank you.

Kind Regards,

Sadia Kousar (Research student)

School of Life and Health Sciences

Aston Triangle

Birmingham

West Midlands

B4 7ET

Appendix 7 Participant information sheet for survey

Participant Information Sheet

Project Title: A Cross-sectional Survey Examining the Experiences and Attitudes of Community Pharmacists Towards Dispensing Errors and Their Role in Ensuring Patient Safety During the Dispensing Process

You are being invited to take part in a research study. Before you decide whether or not to take part, it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully.

What is the purpose of the study?

The safe and effective supply of medicines is one of the core functions of the community pharmacist. The community pharmacy contractual changes of 2005 attempted to redirect the activity of pharmacists away from this 'supply function' and towards involvement in harm-reduction and health-improvement services. However, the supply of medicines remains the primary function of the vast majority of community pharmacists. At present it is unclear how pharmacists are coping with the supply function as well as the provision of health-improvements services, and how these may be impacting patient safety and the occurrence of dispensing errors. This research will explore the experiences and perceptions of community pharmacists surrounding dispensing errors and how these experiences can influence the pharmacist's dispensing practice.

Why have I been chosen?

All community pharmacists from the database of an indemnity insurance provider and have been invited to take part in this study.

What will happen to me if I take part?

If you decide to take part in the study, you will be asked to complete an online survey, which it is estimated will take around 10 minutes to complete. You will be provided with a link to the survey in the e-mail inviting you to take part. By clicking on the link provided you will enter the survey.

The survey will ask you some questions about your experience, thoughts and opinions about dispensing errors in community pharmacy as well as the working conditions of community

pharmacists. All your responses will be kept completely confidential and you will not be identified in any publication resulting from this research.

Are there any potential risks in taking part in the study?

It is not expected that you will experience any adverse effects as a result of participating in the study. The possible risks or discomforts of the study are minimal. Some of the survey questions ask about any dispensing errors you may have made in your experience, as well as current working conditions in community pharmacy. You may find some of the questions to be sensitive and/or distressing as you think about your experiences. All responses to the survey will remain confidential. Nobody, including your employer, will be able to identify you or your place of work from the study results.

Do I have to take part?

No, you have no obligation to take part in this study. If you do decide to take part in the study you can still stop and withdraw at any point before submitting the survey.

Will my taking part in this study be kept confidential?

All responses to the survey will be kept strictly confidential. The responses to the survey will be sent to a secure server, and only the researcher will have access to the responses. You will not be able to be identified in any reports or publications.

What will happen to the results of the research study?

The data from the surveys will be analysed to produce results, which will be published as part of a PhD thesis and potentially in an academic journal. The researcher's academic supervisors may look at the data however nobody will be able to identify you from your responses to the questions or results of the study.

Who is organising and funding the research?

Sadia Kousar, a PhD student from the School of Life and Health Sciences at Aston University is organising and conducting the research. The research is supervised by Dr Joe Bush from the School of Life and Health Sciences at Aston University. The research is funded by an internal scholarship provided by the School of Life and Health Sciences at Aston University.

Who has reviewed the study?

The study has been given a favourable opinion by the Ethics Committee of the School of Life and Health Sciences at Aston University.

Who do I contact if something goes wrong or I need further information?

If you have any questions, concerns or would like further information about the study please feel free to contact the researcher, Sadia Kousar, at [REDACTED] or on [REDACTED]

You can also contact the researcher's supervisor, Dr Joe Bush at [REDACTED] or on [REDACTED]

Who do I contact if I wish to make a complaint about the way in which the research is conducted?

If you have any concerns about the way in which the study has been conducted you should contact John Walter, Director of Governance of the School of Life and Health Sciences Ethics Committee, Aston University, at [REDACTED] or on [REDACTED]

Appendix 8 Survey Instrument



Please initial each box to indicate you have read the statement.

I have read the study information (version 4, date 24/07/17) and know who to contact should I have any questions about my participation in the study.

☐

I understand that my participation in the study is voluntary, and that I am free to withdraw at any time. I do not have to give any reasons or explanations for doing so. I have been provided with details of who I should contact if I wish to withdraw.

☐

I understand that all data I provide will be kept confidential and stored securely on a password protected computer. Any hard copies of data will be stored in a locked filing cabinet.

☐

I agree to participate in this research study.

☐

Please print name and date below:

Name

Date

Section 1 - Occupational details

Q1 Indicate which of the following applies to you (tick the one response that is most appropriate).

- ☐ I work entirely in community pharmacy
- ☐ I work partly in community pharmacy and partly in an(other) area(s) of the pharmacy profession
- ☐ I work partly in community pharmacy and partly outside of the pharmacy profession
- ☐ I used to work in community pharmacy
- ☐ I am a retired community pharmacist
- ☐ I am not in active employment
- ☐ I work entirely outside of community pharmacy

Q2 In which year did you first register as a pharmacist?

--Click Here--▼
1940
1941
1942
1943
1944
1945
1946
1947
1948
1949
1950
1951
1952
1953
1954
1955
1956
1957
1958
1959
1960
1961
1962
1963
1964
1965
1966
1967
1968
1969
1970
1971
1972
1973
1974
1975
1976
1977
1978
1979
1980
1981
1982
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996

Q2 In which year did you first register as a pharmacist?

1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017

Q3 Do you work part-time or full-time?

- ☐ Part-time (fewer than 35 hours per week)
☐ Full-time (35 hours or more per week)

Q4 Tick the box that most closely corresponds to the job you hold within community pharmacy.

- ☐ Proprietor/owner
☐ Pharmacist
☐ Manager
☐ Relief pharmacist
☐ Second pharmacist
☐ Locum
☐ Non-store based pharmacist
☐ Other

If other, please specify.

Q5 Indicate which type of pharmacy you have most regularly worked in during the last six months.

- ☐ Supermarket
☐ Multiple (200 outlets or more)
☐ Large chain (more than 20 outlets but fewer than 200)
☐ Small chain (20 outlets or fewer but more than 5)
☐ Independent (5 outlets or fewer)

Q6 On average, how many hours do you work per day? Include any time taken for lunch and rest breaks. (Please make sure answers are no more than 2 decimal places in length.

- Q7 During an average working day, how much time (**in hours**) do you spend doing each of the following activities? Please make sure that the total time is equal to the number of hours you work per day (as indicated in Question 6) and that answers are no more than 2 decimal places in length.

Dispensing of medicines ?	<input type="text"/>
Clinical Services ?	<input type="text"/>
Administrative/management work ?	<input type="text"/>
Professional development ?	<input type="text"/>
Breaks ?	<input type="text"/>
Other	<input type="text"/>
Total	<input type="text"/>

Section 2 - Dispensing of Medicines

- Q8 How many prescription items do you process during an average working day? ?

- ☐ 0-100
☐ 101-200
☐ 201-300
☐ 301-400
☐ 401-500
☐ 501-600
☐ 601-700
☐ 701-800
☐ 801-900
☐ 901-1000
☐ 1000+

- Q9 A 'dispensing error' can be defined as an error that takes place during the dispensing process and reaches the patient, i.e. it is unrecognised before the patient is supplied with the medication and the medication has left the pharmacy. This would comprise any errors involving **incorrect content** such as incorrect drug, strength, form, added or missing dose units and expired medication, **labelling errors**, which comprise incorrect drug name, form, strength, quantity, dosage instructions and patient name, **errors in counselling** the patient/representative about their prescribed medication, as well **incorrect supply** which is where the correct medication has been supplied to the incorrect patient/representative. **Do you believe that the risk of dispensing errors is increasing or decreasing in community pharmacy?**

- ☐ Increasing
☐ Decreasing
☐ Neither increasing nor decreasing
☐ Don't know

- Q10 Do you believe that **actual** dispensing errors are becoming more common or less common?
- ☐ More common
- ☐ Less common
- ☐ Neither more common nor less common
- ☐ Don't know
- Q11 A 'near-miss' can be defined as an error that takes place during the dispensing process but does not reach the patient i.e. it is identified before the patient has been supplied with the medication and the medication has left the pharmacy. **Do you believe that near-misses are becoming more common or less common?**
- ☐ More common
- ☐ Less common
- ☐ Neither more common nor less common
- ☐ Don't know
- Q12 According to your experience in community pharmacy, what do you believe is the likelihood of a dispensing error taking place?
- ☐ Extremely unlikely (1 error per 6 months)
- ☐ Unlikely (1 error per month)
- ☐ Somewhat likely (1 error per week)
- ☐ Likely (1 error per day)
- ☐ Extremely likely (several errors per day)
- ☐ Don't know
- Q13 According to your experience in community pharmacy, what do you believe is the likelihood of a 'near-miss' taking place?
- ☐ Extremely unlikely (1 near-miss per 6 months)
- ☐ Unlikely (1 near-miss per month)
- ☐ Somewhat likely (1 near-miss per week)
- ☐ Likely (1 near-miss per day)
- ☐ Extremely likely (several near-misses per day)
- ☐ Don't know
- Q14 Are you aware of any dispensing errors at your place/s of practice during the last six months?
- ☐ Yes
- ☐ No
- ☐ Don't know
- Q15 If yes, approximately how many dispensing errors in your place/s of practice are you aware of?
-

Q16 We are interested in identifying variables that pharmacists perceive as being associated with dispensing errors. Do you believe that each of the following factors is associated with the occurrence of errors in dispensing. Answer each by choosing from a scale of 0 to 10 with 0 indicating 'no association at all' and 10 indicating 'very high association'.

	No association	1	2	3	4	5	6	7	8	9	Very high association
Staff Shortages	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Multi-tasking	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Stress and work pressures	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Lack of rest breaks	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Pharmacist overwork	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Unorganised/cluttered dispensary	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Pharmacist fatigue of any cause	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Inadequately trained dispensary staff (excluding pharmacist)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Distractions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Interruptions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
High prescription volume (dispensing workload)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Clinical services workload	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Pressure due to waiting patients	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Similarities in packaging	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Items placed next to each other on shelf	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Self-checking ?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Pharmacist working on his/her own	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Section 3 - Preventing Dispensing Errors

Q17 Which of the following factors would you nominate as being important in minimising the risk of dispensing errors? Answer each by choosing from a scale of 0 to 10 with 0 indicating 'not important' and 10 indicating 'very important'.

	Not important	1	2	3	4	5	6	7	8	9	Very important
Having more than one pharmacist on duty	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Putting in place policies outlining the number of staff required to run each pharmacy safely	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Improving dispensary support staff training or recruiting dispensary support staff of a higher calibre	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Putting in place standards for sufficient and regular rest breaks	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Reducing workloads on pharmacists	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Greater regulation over promotion and advertisement of community pharmacy services	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Reducing pharmacists' working hours	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Managing distractions and interruptions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Managing patients' expectations	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Reducing work pressures	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Improving the packaging and labelling of drug products	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Improvements in the physical environment of the dispensary	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Educating the public about the role of the pharmacist	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Encouraging employers to create a safer working environment for pharmacists and pharmacy staff.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Are there any other relevant factors that you can suggest? Please list these below.

Q18 Some regulatory bodies overseas (e.g. USA) have imposed maximum safe dispensing limits for pharmacists. Do you believe there should be a regulatory guideline for the maximum safe dispensing load in the UK?

☐ Yes

☐ No

Q19 Approximately how many prescription items do you believe can be safely dispensed per day (9am-6pm) by/in the presence of one pharmacist with no dispensary support staff?

If you cannot give a suggestion, or if you would like to provide a comment, please do so below.

Section 4 - Working Conditions

Q20 We are interested in gaining more information about the working conditions of community pharmacists. Please read the following statement and rate how much you agree with each.

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
I feel I work longer hours than I consider to be safe	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

I feel that the dispensary support staff work longer hours than I consider to be safe	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
There are a sufficient number of staff to manage the workload overall	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The staff I work with are adequately trained for their roles in the dispensary	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
In the event of a dispensing error, the dispensary staff are willing to learn from the incident	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I feel that, in current working conditions there is a greater chance of an error taking place	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The workload that I have to manage at work is more than I consider to be safe	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I am constantly stressed at work	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Outside of work, I am constantly stressed	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The volume of medicines to be dispensed is the main cause of work pressure and stress	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Providing clinical services is the main cause of work pressure and stress	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Expectation to reach company targets is the main cause of work pressure and stress	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Unrealistic patient expectations are the main cause of work pressure and stress	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Dispensing of medicines is what I like best about my job	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Providing clinical services is what I like best about my job	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I feel I have sufficient rest breaks (mental and physical) during my working day	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Taking a rest break when I feel overworked tends to be frowned upon	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
There is adequate seating available to sit on if needed	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I feel I can easily make decisions using my professional judgement	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I have to compromise my professional autonomy in order to maintain good relationships with my senior manager/colleagues	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Overall, I am satisfied with my job	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Section 5 - About You

Q21 What is your age in years?

- ☐ Under 30
- ☐ 30-39
- ☐ 40-49
- ☐ 50-59
- ☐ 60 and over
- ☐ Prefer not to say

Q22 What is your sex?

- ☐ Male
- ☐ Female
- ☐ Prefer not to say

Q23 How would you best describe your ethnic background?

- ☐ White British
- ☐ White Irish
- ☐ Other white background
- ☐ Black Caribbean
- ☐ Black african
- ☐ Any other black background
- ☐ White and Black Caribbean
- ☐ White and Black African
- ☐ White Asian
- ☐ Any other mixed background
- ☐ British Asian
- ☐ Indian
- ☐ Pakistani
- ☐ Bangladeshi
- ☐ Any other Asian background
- ☐ Chinese
- ☐ Any other background
- ☐ Prefer not to say